Rule 1.5. Water Quality Standards Applicable to All State Waters Within the Great Lakes System

327 IAC 2-1.5-1 Applicability of rule

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 1. The water quality standards established by this rule shall apply to all waters of the state within the Great Lakes system. *(Water Pollution Control Board; 327 IAC 2-1.5-1; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1363)*

327 IAC 2-1.5-2 Definitions

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-11-2; IC 13-18-4

Sec. 2. In addition to the definitions contained in IC 13-11-2 and 327 IAC 1, the following definitions apply throughout this article, 327 IAC 5, and 327 IAC 15:

(1) "Acceptable daily exposure" or "ADE" means an estimate of the maximum daily dose of a substance which is not expected to result in adverse noncancer effects to the general human population, including sensitive subgroups.

(2) "Acceptable endpoints" (subchronic and chronic), for the purpose of wildlife criteria derivation, means those endpoints that affect reproductive or developmental success, organismal viability or growth, or any other endpoint that is, or is directly related to, a parameter that influences population dynamics.

(3) "Acute-chronic ratio" or "ACR" means a standard measure of the acute toxicity of a material divided by an appropriate measure of the chronic toxicity of the same material under comparable conditions.

(4) "Acute toxic unit" or "$TU_a$" means $100/LC_{50}$ where the $LC_{50}$ is expressed as a percent effluent in the test medium of an acute whole effluent toxicity (WET) test that is statistically or graphically estimated to be lethal to fifty percent (50%) of the test organisms.

(5) "Acute toxicity" means concurrent and delayed adverse effects that result from an acute exposure and occur within any short observation period which begins when the exposure begins, may extend beyond the exposure period, and usually does not constitute a substantial portion of the life span of the organism.

(6) "Adverse effect" means any deleterious effect to organisms due to exposure to a substance. The term includes effects that are or may become debilitating, harmful, or toxic to the normal functions of the organism, but does not include nonharmful effects, such as tissue discoloration alone or the induction of enzymes involved in the metabolism of the substance.

(7) "Baseline BAF" means the following:

(A) For organic chemicals, a BAF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism.

(B) For inorganic chemicals, a BAF that is based on the wet weight of the tissue.

(8) "Baseline BCF" means the following:

(A) For organic chemicals, a BCF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism.

(B) For inorganic chemicals, a BCF that is based on the wet weight of the tissue.

(9) "Bioaccumulation" means the net accumulation of a substance by an organism as a result of uptake from all environmental sources.

(10) "Bioaccumulation factor" or "BAF" means the ratio (in L/kg) of a substance's concentration in tissue of an aquatic organism to its concentration in the ambient water, in situations where both the organism and its food are exposed and the ratio does not change substantially over time.

(11) "Bioaccumulative chemical of concern" or "BCC" has the meaning set forth in section 6 of this rule.

(12) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through gill membranes or other external body surfaces.

(13) "Bioconcentration factor" or "BCF" means the ratio (in liters per kilogram) of a substance's concentration in tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and the ratio does not change substantially over time.

(14) "Biota-sediment accumulation factor" or "BSAF" means the ratio (in kilograms of organic carbon per kilogram of lipid) of a substance's lipid-normalized concentration in tissue of an aquatic organism to its organic carbon-normalized concentration in surface sediment, in situations where:

(A) the ratio does not change substantially over time;

(B) both the organism and its food are exposed; and

(C) the surface sediment is representative of average surface sediment in the vicinity of the organism.

(15) “Carcinogen” means a substance that causes an increased incidence of benign or malignant neoplasms, or substantially decreases the time to develop neoplasms, in animals or humans. The classification of carcinogens is discussed in section 13(b)(1) of this rule.

(16) “Chronic effect”, for purposes of wildlife criteria derivation, means:

(A) an adverse effect that is measured by assessing an acceptable endpoint; and

(B) results from continual exposure over several generations, or at least over a significant part of the test species' projected life span or life stage.

(17) “Chronic toxic unit” or “$TU_c$ “ means 100/NOEC or 100/$IC_{25}$, where the NOEC and $IC_{25}$ are expressed as a percent effluent in the test medium.

(18) “Chronic toxicity” means concurrent and delayed adverse effects that occur only as a result of a chronic exposure.

(19) “Clean Water Act” or “CWA” means the federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.).

(20) “Coliform bacteria” means all the aerobic and facultatively anaerobic, gram-negative, nonsporeforming bacilli that produce acid and gas from the fermentation of lactose.

(21) “Community” means a general collective term to describe the varieties of aquatic species and associated organisms living together in a waterbody.

(22) “Criteria” means a definite numerical value or narrative statement promulgated by the board to maintain or enhance water quality to provide for and fully protect designated uses of the waters of the state.

(23) “Criterion continuous concentration” or “CCC” means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

(24) “Criterion maximum concentration” or “CMC” means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

(25) “Depuration” means the loss of a substance from an organism as a result of any active or passive process.

(26) “Designated uses” has the meaning set forth in section 5 of this rule, whether or not they are being attained.

(27) “$EC_{50}$” refers to a statistically or graphically estimated concentration that is expected to cause one (1) or more specified effects in fifty percent (50%) of a group of organisms under specified conditions.

(28) “Effluent” means a wastewater discharge from a point source to the waters of the state.

(29) “Endangered or threatened species” includes those species that are listed as endangered or threatened under Section 4 of the Endangered Species Act (ESA).

(30) “ESA” means the Endangered Species Act (ESA), 16 U.S.C. 1531 through 16 U.S.C. 1544.

(31) “Existing uses” includes those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included under section 5 of this rule.

(32) “Final acute value” or “FAV” means:

(A) a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher GMAVs; or

(B) the SMAV of an important or critical species, if the SMAV is lower than the calculated estimate.

(33) “Final chronic value” or “FCV” means:

(A) a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable chronic toxicity tests have been conducted on the material) have higher GMCVs;

(B) the quotient of an FAV divided by an appropriate acute-chronic ratio; or

(C) the SMCV of an important or critical species, if the SMCV is lower than the calculated estimate or the quotient, whichever is applicable.

(34) “Final plant value” or “FPV” means the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test material were measured and the adverse effect was biologically important.

(35) “Food-chain multiplier” or “FCM” means the ratio of a BAF to an appropriate BCF.

(36) “Full body contact” means direct contact with the water to the point of complete submergence.

(37) “Genus mean acute value” or “GMAV” means the geometric mean of the SMAVs for the genus.

(38) “Genus mean chronic value” or “GMCV” means the geometric mean of the SMCVs for the genus.

(39) “Geometric mean” means the Nth root of the product of N quantities. Alternatively, the geometric mean can be calculated by adding the logarithms of the N numbers, dividing the sum by N, and taking the antilog of the quotient.

(40) “Great Lakes” means Lake Erie and Lake Michigan.

(41) “Great Lakes states” means Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and

Wisconsin.
(42) “Great Lakes system” means all the streams, rivers, lakes, and other waters of the state within the drainage basin of the Great Lakes within Indiana.
(43) “Great Lakes water quality wildlife criterion” or “GLWC” means the concentration of a substance that is likely to, if not exceeded, protect avian and mammalian wildlife populations inhabiting the Great Lakes basin from adverse effects resulting from the ingestion of water and aquatic prey taken from surface waters of the Great Lakes system. These criteria are based on existing toxicological studies of the substance of concern and quantitative information about the exposure of wildlife species to the substance, that is, food and water consumption rates. Since toxicological and exposure data for individual wildlife species are limited, a GLWC is derived using a methodology similar to that used to derive noncancer human health criteria. Separate avian and mammalian values are developed using taxonomic class-specific toxicity data and exposure data for five (5) representative Great Lakes basin wildlife species. The following wildlife species selected are representative of avian and mammalian species resident in the Great Lakes basin that are likely to experience the highest exposures to bioaccumulative contaminants through the aquatic food web:

(A) Bald eagle.
(B) Herring gull.
(C) Belted kingfisher.
(D) Mink.
(E) River otter.

(44) “Ground water” means such accumulations of underground water, natural and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this state, but excluding manmade underground storage or conveyance structures.
(45) “High quality waters” means waterbodies in which, on a parameter by parameter basis, the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water. The term includes any waterbody for which the pollutant has not been detected in:

(A) the water column; and
(B) nontransient aquatic organisms at levels that would indicate that a water quality criterion is not being met.

(46) “Human cancer criterion” or “HCC” refers to a human cancer value (HCV) for a pollutant that meets the minimum data requirements for Tier I specified in section 14 of this rule.
(47) “Human cancer value” or “HCV” means the maximum ambient water concentration of a substance at which a lifetime of exposure will represent a plausible upper-bound risk of contracting cancer of one (1) in one hundred thousand (100,000) using the exposure assumptions specified in section 14 of this rule from either:

(A) drinking the water, consuming fish from the water, and water-related recreational activities; or
(B) consuming fish from the water and water-related recreational activities.

(48) “Human noncancer criterion” or “HNC” refers to a human noncancer value (HNV) for a pollutant that meets the minimum data requirements for Tier I specified in section 14 of this rule.
(49) “Human noncancer value” or “HNV” means the maximum ambient water concentration of a substance at which adverse noncancer effects are not likely to occur in the human population from lifetime exposure using section 14 of this rule from either:

(A) drinking the water, consuming fish from the water, and water-related recreational activities; or
(B) consuming fish from the water, and water-related recreation activities.

(50) “Inhibition concentration 25” or “$IC_{25}$” means the toxicant concentration that would cause a twenty-five percent (25%) reduction in a nonquantal biological measurement for the test population. For example, the $IC_{25}$ is the concentration of toxicant that would cause a twenty-five percent (25%) reduction in mean young per female or in growth for the test population.
(51) “$LC_{50}$” refers to a statistically or graphically estimated concentration that is expected to be lethal to fifty percent (50%) of a group of organisms under specified conditions.
(52) “Linearized multi-stage model” means a conservative mathematical model for cancer risk assessment. This model fits linear dose-response curves to low doses. It is consistent with a no-threshold model of carcinogenesis, that is, exposure to even a very small amount of the substance is assumed to produce a finite increased risk of cancer.
(53) “Lowest observed adverse effect level” or “LOAEL” means the lowest tested dose or concentration of a substance that resulted in an observed adverse effect in exposed test organisms when all higher doses or concentrations resulted in the same or more severe effects.
(54) “Maximum contaminant level” or “MCL” means the maximum permissible level of a contaminant in water that is delivered to the free flowing outlet of the ultimate user of a public water supply system.
(55) “Mixing zone” means an area contiguous to a discharge where the discharged wastewater mixes with the receiving water. Where the quality of the effluent is lower than that of the receiving water, it may not be possible to attain within

the mixing zone all beneficial uses attained outside the zone. The mixing zone should not be considered a place where effluents are treated.

(56) "New Great Lakes discharger" has the meaning set forth in 327 IAC 5-1.5-36.

(57) "No observed adverse effect level" or "NOAEL" is the highest tested dose or concentration of a substance that resulted in no observed adverse effect in exposed test organisms where higher doses or concentrations resulted in an adverse effect.

(58) "No observed effect concentration" or "NOEC" is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life cycle (short term) test, that causes no observable adverse effects on the test organisms, that is, the highest concentration of toxicant in which the values for the observed responses are not statistically significantly different from the controls.

(59) "Nonthreshold mechanism" means a process that results in some possible effect no matter what level is present. There is no level that may not produce an effect.

(60) "Occur at the site" includes the species, genera, families, orders, classes, and phyla that:

(A) are usually present at the site;

(B) are present at the site only seasonally due to migration;

(C) are present intermittently because they periodically return to or extend their ranges into the site;

(D) were present at the site in the past, are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve; or

(E) are present in nearby bodies of water, are not currently present at the site due to degraded conditions, and are expected to be present at the site when conditions improve.

The taxa that occur at the site cannot be determined merely by sampling downstream and upstream of the site at one (1) point in time. The term does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site, for example, alterations resulting from dams.

(61) "Octanol-water partition coefficient" or "$K_{OW}$" means the ratio of the concentration of a substance in the n-octanol phase to its concentration in the aqueous phase in an equilibrated two-phase octanol-water system. For log $K_{OW}$, the log of the octanol-water partition coefficient is a base ten (10) logarithm.

(62) "Open waters of Lake Michigan" means all of the waters within Lake Michigan lakeward from a line drawn across the mouth of tributaries to the lake, including all waters enclosed by constructed breakwaters. For the Indiana Harbor Ship Canal, the boundary of the open waters of Lake Michigan is delineated by a line drawn across the mouth of the harbor from the East Breakwater Light (1995 United States Coast Guard Light List No. 19675) to the northernmost point of the LTV Steel property along the west side of the harbor.

(63) "Outstanding national resource waters" means those waters designated as such by Indiana. The designation shall describe the quality of such waters to serve as the benchmark of the water quality that shall be maintained and protected. Waters that may be considered for designation as outstanding national resource waters include, but are not limited to, waterbodies that are recognized as:

(A) important because of protection through official action, such as:

(i) federal or state law;

(ii) presidential or secretarial action;

(iii) international treaty; or

(iv) interstate compact;

(B) having exceptional recreational significance;

(C) having exceptional ecological significance;

(D) having other special environmental, recreational, or ecological attributes; or

(E) waters whose designation as outstanding national resource waters is reasonably necessary for the protection of other waters so designated.

(64) "Outstanding state resource waters" means those waters designated as such by Indiana.

(65) "Point source" has the meaning set forth in 327 IAC 5-1.5-40.

(66) "Policy" means a statement of administrative practice or decision making guidelines to be followed or implemented to the maximum extent feasible with respect to an identified problematic situation but to be less than strictly enforceable in contrast to a standard or rule of law.

(67) "Public water supply" means any wells, reservoirs, lakes, rivers, sources of supply, pumps, mains, pipes, facilities, and structures through which water is obtained, treated as may be required, and supplied through a water distribution system for sale to or consumption by the public for drinking, domestic, or other purposes, including state-owned facilities even though the water may not be sold to the public.

(68) "Quantitative structure activity relationship" or "QSAR" or "structure activity relationship" or "SAR" refers to a mathematical relationship between a property (activity) of a chemical and a number of descriptors of the chemical.

These descriptors are chemical or physical characteristics obtained experimentally or predicted from the structure of the chemical.

(69) "Relative source contribution" or "RSC" means the factor (percentage) used in calculating a HNV or HNC to account for all sources of exposure to a contaminant. The RSC reflects the percent of total exposure that may be attributed to surface water through water intake and fish consumption.

(70) "Risk" means the probability that a substance, when released to the environment, will cause an adverse effect in exposed humans or other living organisms.

(71) "Risk assessment" means the analytical process used to determine the level of risk.

(72) "Risk associated dose" or "RAD" refers to a dose of a known or presumed carcinogenic substance in milligrams per kilogram per day, which, over a lifetime of exposure, is estimated to be associated with a plausible upper bound incremental cancer risk equal to one (1) in one hundred thousand (100,000).

(73) "Slope factor", also known as "$q_1$*", means the incremental rate of cancer development calculated through use of a linearized multistage model or other appropriate model. It is expressed in milligrams per kilogram per day of exposure to the chemical in question.

(74) "Species mean acute value" or "SMAV" means the geometric mean of the results of all acceptable flow-through acute toxicity tests (for which the concentrations of the test material were measured) with the most sensitive tested life stage of the species. For a species for which no such result is available for the most sensitive tested life stage, the SMAV is the geometric mean of the results of all acceptable acute toxicity tests with the most sensitive tested life stage.

(75) "Species mean chronic value" or "SMCV" means the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests.

(76) "Steady-state" means an equilibrium condition has been achieved in the body burden of a substance in an organism. Steady state is assumed when the rate of loss of a substance matches its rate of uptake.

(77) "Stream design flow" means the stream flow that represents critical conditions, upstream from the source, for protection of aquatic life, human health, or wildlife.

(78) "Subchronic effect" means an adverse effect, measured by assessing an acceptable endpoint, resulting from continual exposure for a period of time less than that deemed necessary for a chronic test.

(79) "Surface waters of the state" or "surface water" means:

(A) either:

(i) the accumulations of water, surface and underground, natural and artificial, public and private; or

(ii) a part of the accumulations of water;

that are wholly or partially within, flow through, or border upon Indiana; and

(B) the term does not include:

(i) a private pond; or

(ii) an off-stream pond, reservoir, or facility built for reduction or control of pollution or cooling of water before discharge;

unless the discharge from the pond, reservoir, or facility causes or threatens to cause water pollution.

(80) "Threshold effect" means an effect of a substance for which there is a theoretical or empirically established dose or concentration below which the effect does not occur.

(81) "Tier I criteria" means numeric values derived by use of the Tier I procedures in sections 11 and 13 through 16 of this rule, that either have been adopted as numeric criteria into a water quality standard or are used to implement narrative water quality criteria.

(82) "Tier I wildlife criterion" means criterion used to denote the number derived from data meeting the Tier I minimum database requirements and will be protective of the two (2) classes of wildlife. The term is synonymous with GLWC, and the two (2) are used interchangeably.

(83) "Tier II values" means numeric values derived by use of the Tier II procedures in sections 12 through 16 of this rule, that are used to implement narrative water quality criteria.

(84) "Toxic substances" means substances that are or may become harmful to:

(A) aquatic life;

(B) humans;

(C) other animals;

(D) plants; or

(E) food chains;

when present in sufficient concentrations or combinations. Toxic substances include, but are not limited to, those pollutants identified as toxic under Section 307(a)(1) of the Clean Water Act.

(85) “Tributaries of the Great Lakes system” means all waters of the Great Lakes system that are not open waters of Lake Michigan or connecting channels.
(86) “Trophic level” means a functional classification of taxa within a community that is based on feeding relationships, for example, aquatic green plants comprise the first trophic level and herbivores comprise the second.
(87) “Uncertainty factor” or “UF” means one (1) of several numeric factors used in operationally deriving criteria from experimental data to account for the quality or quantity of the available data.
(88) “Uptake” means acquisition of a substance from the environment by an organism as a result of any active or passive process.
(89) “Variance” means a deviation from a water quality standard.
(90) “Water use designations” means a use of the waters of the state as established by this rule, including, but not limited to, the following:
(A) Industrial water supply.
(B) Agricultural use.
(C) Public water supply.
(D) Full body contact.
(E) Aquatic life.
(F) Limited use.
(91) “Waters of the state” means:
(A) either:
(i) the accumulations of water, surface and underground, natural and artificial, or public and private; or
(ii) a part of the accumulations of water;
that are wholly or partially within, flow through, or border upon Indiana; and
(B) the term does not include:
(i) a private pond; or
(ii) an off-stream pond, reservoir, or facility built for reduction or control of pollution or cooling of water before discharge;
unless the discharge from the pond, reservoir, or facility causes or threatens to cause water pollution.
(92) “Well-balanced aquatic community” means an aquatic community that is:
(A) diverse in species composition;
(B) contains several different trophic levels; and
(C) is not composed mainly of pollution tolerant species.
(93) “Wildlife value” or “WV” means a value used to denote each representative species that results from using the equation presented in section 15 of this rule, the value obtained from averaging species values within a class, or any value derived from application of the site-specific procedure provided in section 16 of this rule. The WVs calculated for the representative species are used to calculate taxonomic class-specific WVs. The WV is the concentration of a substance which, if not exceeded, should better protect the taxon in question.
(94) “Zone of initial dilution” or “ZID” means the area of the receiving water directly after the end of the pipe where an instantaneous volume of water gives up to a one-to-one (1:1) dilution of the discharge.

*(Water Pollution Control Board; 327 IAC 2-1.5-2; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1363; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-3 Water quality goals

Authority: IC 13-12-3-1; IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1

Sec. 3. The goal of the state is to restore and maintain the chemical, physical, and biological integrity of the waters of the state within the Great Lakes system. In furtherance of this primary goal, it is the public policy of the state that the discharge of:

(1) toxic substances in toxic amounts be prohibited; and
(2) persistent and bioaccumulating toxic substances be reduced or eliminated.

*(Water Pollution Control Board; 327 IAC 2-1.5-3; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1368; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-4 Antidegradation standard

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4; IC 13-30-2-1

Sec. 4. (a) For all surface waters of the state within the Great Lakes system, existing instream water uses and the level of water quality necessary to protect existing uses shall be maintained and protected. Where designated uses of the waterbody are impaired, there shall be no lowering of the water quality with respect to the pollutant or pollutants that are causing the impairment.

(b) Any surface water of the state within the Great Lakes system whose existing quality for any parameter exceeds the criteria established within this rule shall be considered high quality for that parameter consistent with the definition of high quality water found in this rule; and that quality shall be maintained and protected unless the commissioner finds, after full satisfaction of intergovernmental coordination and public participation provisions under 327 IAC 5-2-11.3, that allowing lower water quality is necessary and accomodates *[sic.]* important economic or social development in the area in which the waters are located. In allowing such degradation, the commissioner shall assure water quality adequate to protect existing uses fully. Further, the commissioner shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. The commissioner shall utilize the antidegradation implementation procedures under 327 IAC 5-2-11.3 in determining if a significant lowering of water quality will be allowed.

(c) From the effective date of this section until the expiration date of 327 IAC 5-2-11.7, all high quality waters designated under section 19(b) of this rule as an outstanding state resource water shall be maintained and protected in their present high quality without degradation. Upon expiration of 327 IAC 5-2-11.7, all high quality waters designated under section 19(b) of this rule as an outstanding state resource water shall be maintained in their present high quality without degradation.

(d) High quality waters designated as an outstanding national resource water (such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance) shall be maintained and protected in their present high quality without degradation.

(e) In those cases where the potential lowering of water quality is associated with a thermal discharge, the decision to allow such degradation shall be consistent with Section 316 of the Clean Water Act and 327 IAC 5-7. *(Water Pollution Control Board; 327 IAC 2-1.5-4; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1369; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-5 Surface water use designations; multiple uses

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4; IC 13-30-2-1

Sec. 5. (a) The following water uses are designated by the board:

(1) All surface waters of the state within the Great Lakes system are designated for full-body contact recreation.

(2) All surface waters, except as described in subdivision (7), shall be capable of supporting a well-balanced, warm water aquatic community.

(3) Where natural temperatures will permit, surface waters shall be capable of supporting put-and-take trout fishing. All waters capable of supporting the natural reproduction of trout shall be so maintained. The following waters are designated as salmonid waters and shall be capable of supporting a salmonid fishery:

(A) Trail Creek and its tributaries downstream to Lake Michigan.

(B) East Branch of the Little Calumet River and its tributaries downstream to Lake Michigan via Burns Ditch.

(C) Salt Creek above its confluence with the Little Calumet River.

(D) Kintzele Ditch (Black Ditch) from Beverly Drive downstream to Lake Michigan.

(E) The Galena River and its tributaries in LaPorte County.

(F) The St. Joseph River and its tributaries in St. Joseph County from the Twin Branch Dam in Mishawaka downstream to the Indiana/Michigan state line.

(G) The Indiana portion of the open waters of Lake Michigan.

(H) Those waters designated by the Indiana department of natural resources for put-and-take trout fishing.

(4) All surface waters used for public water supply are designated as a public water supply. This use designation and its corresponding water quality criteria are not to be construed as imposing a user restriction on those exercising or desiring to exercise the use.

(5) All surface waters used for industrial water supply are designated as an industrial water supply. This use designation and its corresponding water quality criteria are not to be construed as imposing a user restriction on those exercising or desiring to exercise the use.

(6) All surface waters used for agricultural purposes are designated as an agricultural use water.

(7) Limited use waters are designated under section 19(a) of this rule pursuant to section 18 of this rule. All waters that are designated as a limited use water under section 19(a) of this rule must be evaluated for restoration and upgrading at

each triennial review of this rule.

(8) Outstanding state resource waters are designated under section 19(b) of this rule pursuant to section 18 of this rule.

(b) Where multiple uses have been designated for a body of water, the most protective of all simultaneously applicable standards will apply. *(Water Pollution Control Board; 327 IAC 2-1.5-5; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1369)*

327 IAC 2-1.5-6 Bioaccumulative chemicals of concern

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4; IC 13-30-2-1

Sec. 6. (a) A bioaccumulative chemical of concern (BCC) is any chemical that meets the following requirements:

(1) Has the potential to cause adverse effects.

(2) Has a half-life of at least eight (8) weeks in the water column, sediment, and biota.

(3) Upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor (BAF) greater than one thousand (1,000) after considering metabolism and other physicochemical properties that might enhance or inhibit bioaccumulation, in accordance with the procedure in section 13 of this rule. The minimum BAF information needed to define a chemical as a BCC is either of the following:

(A) For an organic chemical, either a field-measured BAF or a BAF derived using the BSAF methodology.

(B) For an inorganic chemical, including an organometal, either a field-measured BAF or a laboratory-measured BCF.

(b) Pollutants that are BCCs include, but are not limited to, the following:

Table 6-1

Bioaccumulative Chemicals of Concern

| CAS Number | Substance |
|---|---|
| 57749 | Chlordane |
| 72548 | 4,4'-DDD; p,p'-DDD; 4,4'-TDE; p,p'-TDE |
| 72559 | 4,4'-DDE; p,p'-DDE |
| 50293 | 4,4'-DDT; p,p'-DDT |
| 60571 | Dieldrin |
| 118741 | Hexachlorobenzene |
| 87683 | Hexachlorobutadiene; hexachloro-1,3-butadiene |
| 608731 | Hexachlorocyclohexanes; BHCs |
| 319846 | alpha-Hexachlorocyclohexane; alpha-BHC |
| 319857 | beta-Hexachlorocyclohexane; beta-BHC |
| 319868 | delta-Hexachlorocyclohexane; delta-BHC |
| 58899 | Lindane; gamma-hexachlorocyclohexane; gamma-BHC |
| 7439976 | Mercury |
| 2385855 | Mirex |
| 29082744 | Octachlorostyrene |
| 1336363 | PCBs; polychlorinated biphenyls |
| 608935 | Pentachlorobenzene |

| | |
|---|---|
| 39801144 | Photomirex |
| 1746016 | 2,3,7,8-TCDD; dioxin |
| 634662 | 1,2,3,4-Tetrachlorobenzene |
| 95943 | 1,2,4,5-Tetrachlorobenzene |
| 8001352 | Toxaphene |

(c) The substances established in this subsection shall be treated as BCCs under this rule and under 327 IAC 5-2-11.3 through 327 IAC 5-2-11.6. If additional data becomes available (such as a field-measured BAF) for a substance established in this subsection that conclusively demonstrates that the substance should not be treated as a BCC, the commissioner may determine that it is not necessary to treat the substance as a BCC. Substances treated as BCCs include the following:

Table 6-2

Substances Treated as Bioaccumulative

Chemicals of Concern

| CAS Number | Substance |
|---|---|
| 309002 | Aldrin |
| 84742 | Dibutyl phthalate |
| 72208 | Endrin |
| 76448 | Heptachlor |

*(Water Pollution Control Board; 327 IAC 2-1.5-6; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-7 Mixing zone guidelines
Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 7. (a) All surface water quality criteria in this rule, except as provided in section 8(b)(1) of this rule, are to be applied at a point outside of the mixing zone as determined under 327 IAC 5-2-11.4 to allow for a reasonable admixture of waste effluents with the receiving waters.

(b) The commissioner may deny any mixing zone for a discharge or for certain substances in a discharge in accordance with 327 IAC 5-2-11.4(b)(5) and 327 IAC 5-2-11.4(b)(6). *(Water Pollution Control Board; 327 IAC 2-1.5-7; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370)*

327 IAC 2-1.5-8 Minimum surface water quality criteria
Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1; IC 14-22-9

Sec. 8. (a) All surface water quality criteria in this section, except those provided in subsection (b)(1), will cease to be applicable when the stream flows are less than the applicable stream design flow for the particular criterion as determined under 327 IAC 5-2-11.4.

(b) The following are minimum water quality conditions:

(1) All waters within the Great Lakes system at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance.

(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae

to such degree as to create a nuisance, be unsightly, or otherwise impair the designated uses.

(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill aquatic life, other animals, plants, or humans. To assure protection of aquatic life, the waters shall meet the following requirements:

(i) Concentrations of toxic substances shall not exceed the CMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC shall be met outside the discharge-induced mixing zone:

(AA) for certain substances, a CMC is established and set forth in subdivision (3), Table 8-1, which table incorporates subdivision (4), Table 8-2;

(BB) for substances for which a CMC is not specified in subdivision (3), Table 8-1, a CMC shall be calculated by the commissioner using the procedures in section 11 of this rule, or if the minimum data requirements to calculate a CMC are not met, a secondary maximum concentration (SMC) shall be calculated using the procedures in section 12 of this rule; and

(CC) the CMC or SMC determined under subitem (AA) or (BB) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(ii) A discharge shall not cause acute toxicity, as measured by whole effluent toxicity tests, at any point in the waterbody. Compliance with this criterion shall be demonstrated if a discharge does not exceed 1.0 $TU_a$ in the undiluted discharge. For a discharge into a receiving stream or Lake Michigan, for which an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), compliance with this criterion shall be demonstrated if 0.3 $TU_a$ is not exceeded outside the discharge-induced mixing zone.

This clause shall not apply to the chemical control of plants and animals when that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.

(2) At all times, all waters outside of the applicable mixing zones determined in accordance with 327 IAC 5-2-11.4(c) through 327 IAC 5-2-11.4(f) shall be free of substances in concentrations, that, on the basis of available scientific data, are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, a toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following:

(A) A criterion continuous concentration (CCC) or a secondary continuous concentration (SCC) to protect aquatic life from chronic toxic effects as follows:

(i) For certain substances, a CCC is established and set forth in subdivision (3), Table 8-1 (which table incorporates subdivision (4), Table 8-2).

(ii) For substances for which a CCC is not specified in subdivision (3), Table 8-1, a CCC shall be calculated by the commissioner using the procedures in section 11 of this rule, or if the minimum data requirements to calculate a CCC are not met, a SCC shall be calculated using the procedures in section 12 of this rule.

(iii) The CCC or SCC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) To assure protection of aquatic life, a discharge shall not cause chronic toxicity, as measured by whole effluent toxicity tests, outside of the applicable mixing zone. Compliance with this criterion shall be demonstrated if the waterbody does not exceed 1.0 $TU_c$ at the edge of the mixing zone.

(B) A human noncancer criterion or value (HNC or HNV) to protect human health from adverse noncancer effects that may result from the consumption of aquatic organisms or drinking water from the waterbody determined as follows:

(i) For certain substances, an HNC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HNC is not specified in subdivision (5), Table 8-3, an HNC shall be calculated by the commissioner using the procedures in section 14 of this rule, or if the minimum data requirements to calculate a HNC are not met, an HNV shall be calculated using the procedures in section 14 of this rule.

(iii) The HNC or HNV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HNC-nondrinking or HNV-nondrinking for a substance shall apply to all waters outside the

applicable mixing zone for a discharge of that substance. The HNC-drinking or HNV-drinking shall apply at the point of the public drinking water intake.

(C) For carcinogenic substances, a human cancer criterion or value (HCC or HCV) to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population as follows:

(i) For certain substances, an HCC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HCC is not specified in subdivision (5), Table 8-3, an HCC shall be calculated by the commissioner using the procedures in section 14 of this rule or if the minimum data requirements to calculate a HCC are not met, an HCV shall be calculated using the procedures in section 14 of this rule.

(iii) The HCC or HCV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HCC-nondrinking or HCV-nondrinking for a substance shall apply to all waters outside the applicable mixing zone for a discharge of that substance. The HCC-drinking or HCV-drinking shall apply at the point of the public drinking water intake.

(D) A wildlife criterion (WC) to protect avian and mammalian wildlife populations from adverse effects which may result from the consumption of aquatic organisms or water from the waterbody as follows:

(i) For certain substances, a WC is established and set forth in Table 8-4.

(ii) For substances for which a WC is not specified in subdivision (6), Table 8-4, a WC shall be calculated by the commissioner using the procedures in section 15 of this rule or if the minimum data requirements to calculate a WC are not met, a wildlife value (WV) may be calculated using the procedures in section 15 of this rule.

(iii) The WC or WV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(3) The following establishes water quality criteria for protection of aquatic life:

Table 8-1

Water Quality Criteria for Protection of Aquatic Life[1]

| CAS Number | Substances | CMC (Maximum) (µg/l) | CMC Conversion Factors | CCC (4-Day Average) (µg/l) | CCC Conversion Factors |
|---|---|---|---|---|---|
| | Metals (dissolved)[2] | | | | |
| 7440382 | Arsenic (III) | 339.8 | 1.000 | 147.9 | 1.000 |
| 7440439 | Cadmium | $e^{(1.128\ [\ln(\text{hardness})]-3.6867)}$ | 0.944 | $e^{(0.7852\ [\ln(\text{hardness})]-2.715)}$ | 0.909 |
| 7440473 | Chromium (III) | $e^{(0.819\ [\ln(\text{hardness})]+3.7256)}$ | 0.316 | $e^{(0.819\ [\ln(\text{hardness})]+0.6848)}$ | 0.860 |
| 7440473 | Chromium (VI) | 16.02 | 0.982 | 10.98 | 0.962 |
| 7440508 | Copper | $e^{(0.9422\ [\ln(\text{hardness})]-1.700)}$ | 0.960 | $e^{(0.8545\ [\ln(\text{hardness})]-1.702)}$ | 0.960 |
| 7439976 | Mercury | 1.694 | 0.850 | 0.9081 | 0.850 |
| 7440020 | Nickel | $e^{(0.846\ [\ln(\text{hardness})]+2.255)}$ | 0.998 | $e^{(0.846\ [\ln(\text{hardness})]+0.0584)}$ | 0.997 |
| 7782492 | Selenium | | | 5 | 0.922 |
| 7440666 | Zinc | $e^{(0.8473\ [\ln(\text{hardness})]+0.884)}$ | 0.978 | $e^{(0.8473\ [\ln(\text{hardness})]+0.884)}$ | 0.986 |
| | Organics (total) | | | | |
| 60571 | Dieldrin | 0.24 | NA | 0.056 | NA |
| 72208 | Endrin | 0.086 | NA | 0.036 | NA |
| 56382 | Parathion | 0.065 | NA | 0.013 | NA |
| 87865 | Pentachlorophenol[3] | $e^{(1.005[\text{pH}]-4.869)}$ | NA | $e^{(1.005[\text{pH}]-5.134)}$ | NA |
| | Other Substances | | | | |
| | Chlorides (total) | 860000 | NA | 230000 | NA |
| | Chlorine (total residual) | 19 | NA | 11 | NA |
| | Chlorine (intermittent, total residual)[4] | 200 | NA | | NA |
| 57125 | Cyanide (free) | 22 | NA | 5.2 | NA |

[1] Aquatic organisms should not be affected unacceptably if the four (4) day average concentration of any substance in this table does not exceed the CCC more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed the CMC more than once every three (3) years on the average, except possibly where a commercially or recreationally important species is very sensitive.

[2] The CMC and CCC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the CMC or CCC. This dissolved CMC or CCC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limits (WQBELs).

[3] A CMC and CCC calculated for pentachlorophenol using the equation in this table shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limits (WQBELs).

[4] To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

(4) The following establishes dissolved criterion maximum concentrations (CMCs) and criterion continuous concentrations (CCCs) for certain metals at selected hardness values calculated from the equations and conversions factors in subdivision (3), Table 8-1:

Table 8-2

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$

| | Cadmium | | Chromium (III) | | Copper | | Nickel | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hardness | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC |
| 50 | 2.0 | 1.3 | 320 | 42 | 7.0 | 5.0 | 260 | 29 | 65 | 66 |
| 100 | 4.3 | 2.2 | 570 | 74 | 13 | 9.0 | 470 | 52 | 120 | 120 |
| 150 | 6.7 | 3.1 | 790 | 100 | 20 | 13 | 660 | 73 | 170 | 170 |
| 200 | 9.3 | 3.9 | 1,000 | 130 | 26 | 16 | 840 | 93 | 210 | 210 |
| 250 | 12 | 4.6 | 1,200 | 160 | 32 | 20 | 1,000 | 110 | 250 | 260 |
| 300 | 15 | 5.3 | 1,400 | 180 | 38 | 23 | 1,200 | 130 | 300 | 300 |
| 350 | 18 | 6.0 | 1,600 | 210 | 44 | 26 | 1,400 | 150 | 340 | 340 |
| 400 | 20 | 6.6 | 1,800 | 230 | 50 | 29 | 1,500 | 170 | 380 | 380 |
| 450 | 23 | 7.3 | 2,000 | 250 | 55 | 32 | 1,700 | 190 | 420 | 420 |
| 500 | 26 | 7.9 | 2,100 | 280 | 61 | 35 | 1,800 | 200 | 460 | 460 |

(5) The following establishes water quality criteria for protection of human health:

Table 8-3

Water Quality Criteria for Protection of Human Health[1]

| | | Human Noncancer Criteria (HNC) | | Human Cancer Criteria (HCC) | |
|---|---|---|---|---|---|
| CAS Number | Substances | Drinking (µg/l) | Nondrinking (µg/l) | Drinking (µg/l) | Nondrinking (µg/l) |
| | Metals (total recoverable) | | | | |
| 7439976 | Mercury (including methyl mercury) | 0.0018 | 0.0018 | | |
| | Organics (total) | | | | |
| 71432 | Benzene | 19 | 510 | 12 | 310 |
| 57749 | Chlordane | 0.0014 | 0.0014 | 0.00025 | 0.00025 |
| 108907 | Chlorobenzene | 470 | 3,200 | | |
| 50293 | DDT | 0.002 | 0.002 | 0.00015 | 0.00015 |
| 60571 | Dieldrin | 0.00041 | 0.00041 | $6.5 \times 10^{-6}$ | $6.5 \times 10^{-6}$ |
| 105679 | 2,4-dimethylphenol | 450 | 8,700 | | |
| 51285 | 2,4-dinitrophenol | 55 | 2,800 | | |
| 118741 | Hexachlorobenzene | 0.046 | 0.046 | 0.00045 | 0.00045 |
| 67721 | Hexachloroethane | 6 | 7.6 | 5.3 | 6.7 |
| 58899 | Lindane | 0.47 | 0.5 | | |

| | | | | | |
|---|---|---|---|---|---|
| 75092 | Methylene chloride | 1,600 | 90,000 | 47 | 2600 |
| 1336363 | PCBs (class) | | | $6.8 \times 10^{-6}$ | $6.8 \times 10^{-6}$ |
| 1746016 | 2, 3, 7, 8-TCDD (dioxin) | $6.7 \times 10^{-8}$ | $6.7 \times 10^{-8}$ | $8.6 \times 10^{-9}$ | $8.6 \times 10^{-9}$ |
| 108883 | Toluene | 5,600 | 51,000 | | |
| 8001352 | Toxaphene | | | $6.8 \times 10^{-5}$ | $6.8 \times 10^{-5}$ |
| 79016 | Trichloroethylene | | | 29 | 370 |
| | Other Substances | | | | |
| 57125 | Cyanide (total) | 600 | 48,000 | | |

[1]The HNC and HCC are thirty (30) day average criteria.

(6) The following establishes water quality criteria for protection of wildlife:

Table 8-4

Water Quality Criteria for Protection of Wildlife[1]

| CAS Number | Substances | Wildlife Criteria (µg/l) |
|---|---|---|
| | Metals (total recoverable) | |
| 7439976 | Mercury (including methylmercury) | 0.0013 |
| | Organics (total) | |
| 50293 | DDT and metabolites | $1.1 \times 10^{-5}$ |
| 1336363 | PCBs (class) | $1.2 \times 10^{-4}$ |
| 1746016 | 2, 3, 7, 8-TCDD (dioxin) | $3.1 \times 10^{-9}$ |

[1]The WC are thirty (30) day average criteria.

(c) This subsection establishes minimum water quality criteria for aquatic life. In addition to the criteria in subsection (b), this subsection ensures conditions necessary for the maintenance of a well-balanced aquatic community. The following conditions are applicable at any point in the waters outside of the applicable mixing zone, as determined in accordance with section 7 of this rule and 327 IAC 5-2-11.4(b):

(1) There shall be no substances which impart unpalatable flavor to food fish or result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) nor above nine (9.0), except daily fluctuations that exceed pH 9.0 and are correlated with photosynthetic activity shall be permitted.

(3) Concentrations of dissolved oxygen shall average at least five (5.0) milligrams per liter per calendar day and shall not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) No abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(C) Water temperatures shall not exceed the maximum limits as established in this clause during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three degrees Fahrenheit (3°F) (one and seven-tenths degrees Celsius (1.7°C)):

Table 8-5

Maximum Instream Water Temperatures

| St. Joseph River Tributary to Lake Michigan Upstream of the | All Other Indiana Streams in the Great |
|---|---|

| Month | Twin Branch Dam ☜F(☜C) | Lakes System ☜F(☜C) |
|---|---|---|
| January | 50 (10) | 50 (10) |
| February | 50 (10) | 50 (10) |
| March | 55 (12.8) | 60 (15.6) |
| April | 65 (18.3) | 70 (21.1) |
| May | 75 (23.9) | 80 (26.7) |
| June | 85 (29.4) | 90 (32.2) |
| July | 85 (29.4) | 90 (32.2) |
| August | 85 (29.4) | 90 (32.2) |
| September | 84 (29.4) | 90 (32.2) |
| October | 70 (21.1) | 78 (25.5) |
| November | 60 (15.6) | 70 (21.1) |
| December | 50 (10) | 57 (14.0) |

(D) The following temperature criteria shall apply to Lake Michigan:

(i) In all receiving waters, the points of measurement normally shall be in the first meter below the surface at such depths necessary to avoid thin layer surface warming due to extreme ambient air temperatures, but where required to determine the true distribution of heated wastes and natural variations in water temperatures, measurements shall be at a greater depth and at several depths as a thermal profile.

(ii) There shall be no abnormal temperature changes so as to be injurious to fish, wildlife, or other aquatic life, or the growth or propagation thereof. In addition, plume interaction with the bottom shall be minimized and shall not injuriously affect fish, shellfish, and wildlife spawning or nursery areas.

(iii) The normal daily and seasonal temperature fluctuations that existed before the addition of heat shall be maintained.

(iv) At any time and at a maximum distance of a one thousand (1,000) foot arc inscribed from a fixed point adjacent to the discharge or as agreed upon by the commissioner and federal regulatory agencies:

(AA) the receiving water temperature shall not be more than three degrees Fahrenheit (3☜F) (one and seven-tenths degrees Celsius (1.7☜C)) above the existing natural water temperature; and

(BB) thermal discharges to Lake Michigan shall comply with the following maximum temperature requirements:

(aa) Thermal discharges to Lake Michigan shall not raise the maximum temperature in the receiving water above those listed in the following table, except to the extent the permittee adequately demonstrates that the exceedance is caused by the water temperature of the intake water:

Table 8-6

Maximum Water Temperatures

| Month | ☜F(☜C) |
|---|---|
| January | 45 (7) |

| | |
|---|---|
| February | 45 (7) |
| March | 45 (7) |
| April | 55 (13) |
| May | 60 (16) |
| June | 70 (21) |
| July | 80 (27) |
| August | 80 (27) |
| September | 80 (27) |
| October | 65 (18) |
| November | 60 (16) |
| December | 50 (10) |

(bb) If the permittee demonstrates that the intake water temperature is within three degrees Fahrenheit (3☜F) below an applicable maximum temperature under subitem (aa), Table 8-6, then no more than a three degree Fahrenheit (3☜F) exceedance of the maximum water temperature shall be permitted.

(v) The facilities described as follows that discharge into the open waters of Lake Michigan shall be limited to the amount essential for blowdown in the operation of a closed cycle cooling facility:

(AA) All facilities that have new waste heat discharges exceeding a daily average of five-tenths (0.5) billion British thermal units per hour. As used in this item, "new waste heat discharge" means a discharge that had not begun operations as of February 11, 1972.

(BB) All facilities with existing waste heat discharges that increase the quantity of waste heat discharged by more than a daily average of five-tenths (0.5) billion British thermal units per hour.

(vi) Water intakes shall be designed and located to minimize entrainment and damage to desirable organisms. Requirements may vary depending upon local conditions but, in general, intakes shall have minimum water velocity and shall not be located in spawning or nursery areas of important fishes. Water velocity at screens and other exclusion devices shall also be at a minimum.

(vii) Discharges other than those now in existence shall be such that the thermal plumes do not overlap or intersect.

(viii) Facilities discharging more than a daily average of five-tenths (0.5) billion British thermal units of waste heat shall continuously record intake and discharge temperature and flow and make those records available to the public or regulatory agencies upon request.

(5) The following criteria shall be used to regulate ammonia:

(A) Concentrations of total ammonia (as N) shall not exceed the CMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC shall be met outside the discharge-induced mixing zone. The CMC of total ammonia (as N) is determined using the following equation:

func{CMC~=~{(0.822)`(0.52)`(10 sup {(pk sub a ~-~pH)}~+~1)} over {(FT)`(FPH)`(2)}}

Where:

$FT = 10^{0.03(20-T)}$

FPH = 1; when: 8 ≮ pH ≮ 9; or

func{{1~+~10 sup {(`7.4``-``pH`)}} over {1.25}} ; when: 6.5 ≮ pH ≮ 8

$pk_a$ = func{{0.09018 ````+``` {2729 over {T ``+`` 273.2}}}}

T = Temperature in ☜C

(B) The criterion continuous concentration (CCC) of total ammonia (as N) is determined using the following equation:

func{CCC~=~{(0.822)`(0.80)`(10 sup {(pk sub a ~-~pH)}~+~1)} over {(FT)`(FPH)`(RATIO)}}

Where:

$FT = 10^{0.03(20-T)}$

FPH = 1; when: 8 ≤ pH ≤ 9; or

func{{1~+~10 sup {(`7.4``-```pH`)}} over {1.25}} ; when: 6.5 ≤ pH ≤ 8

RATIO = 13.5; when: 7.7 ≤ pH ≤ 9; or

func{{(20)(10 sup {(7.7``-```pH`)}`)} over {1 ~+~10 sup {(7.4``-```pH`)}}} ; when: 6.5 ≤ pH ≤ 7.7

$pk_a$ = func {{{0.09018 ```+`` {2729 over {T ``+`` 273.2}}}}}

T = Temperature in ☜C

(C) The use of the equations in clause (A) results in the following CMCs for total ammonia (as N) at different temperatures and pHs:

Table 8-7

Criterion Maximum Concentrations for

Total Ammonia (as N)

Temperature (☜C)

| pH | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|---|---|
| 6.5 | 28.48 | 26.61 | 25.23 | 24.26 | 23.64 | 23.32 | 23.29 |
| 6.6 | 27.68 | 25.87 | 24.53 | 23.59 | 22.98 | 22.68 | 22.65 |
| 6.7 | 26.74 | 24.99 | 23.69 | 22.78 | 22.20 | 21.92 | 21.90 |
| 6.8 | 25.64 | 23.96 | 22.72 | 21.85 | 21.30 | 21.03 | 21.01 |
| 6.9 | 24.37 | 22.78 | 21.60 | 20.78 | 20.26 | 20.01 | 20.00 |
| 7.0 | 22.95 | 21.45 | 20.35 | 19.58 | 19.09 | 18.86 | 18.86 |
| 7.1 | 21.38 | 19.98 | 18.96 | 18.24 | 17.80 | 17.59 | 17.60 |
| 7.2 | 19.68 | 18.40 | 17.46 | 16.81 | 16.40 | 16.22 | 16.24 |
| 7.3 | 17.90 | 16.73 | 15.88 | 15.29 | 14.93 | 14.78 | 14.81 |
| 7.4 | 16.06 | 15.02 | 14.26 | 13.74 | 13.42 | 13.30 | 13.35 |
| 7.5 | 14.23 | 13.31 | 12.64 | 12.19 | 11.92 | 11.81 | 11.88 |
| 7.6 | 12.44 | 11.65 | 11.07 | 10.67 | 10.45 | 10.37 | 10.45 |
| 7.7 | 10.75 | 10.06 | 9.569 | 9.238 | 9.052 | 9.003 | 9.088 |
| 7.8 | 9.177 | 8.597 | 8.181 | 7.907 | 7.760 | 7.734 | 7.830 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7.9 | 7.753 | 7.268 | 6.924 | 6.701 | 6.589 | 6.584 | 6.689 |
| 8.0 | 6.496 | 6.095 | 5.813 | 5.636 | 5.555 | 5.569 | 5.683 |
| 8.1 | 5.171 | 4.857 | 4.639 | 4.508 | 4.457 | 4.486 | 4.602 |
| 8.2 | 4.119 | 3.873 | 3.707 | 3.612 | 3.584 | 3.625 | 3.743 |
| 8.3 | 3.283 | 3.092 | 2.967 | 2.900 | 2.891 | 2.942 | 3.061 |
| 8.4 | 2.618 | 2.472 | 2.379 | 2.335 | 2.340 | 2.399 | 2.519 |
| 8.5 | 2.091 | 1.979 | 1.911 | 1.886 | 1.903 | 1.968 | 2.089 |
| 8.6 | 1.672 | 1.588 | 1.540 | 1.529 | 1.555 | 1.625 | 1.747 |
| 8.7 | 1.339 | 1.277 | 1.246 | 1.246 | 1.279 | 1.353 | 1.475 |
| 8.8 | 1.075 | 1.030 | 1.011 | 1.021 | 1.060 | 1.137 | 1.260 |
| 8.9 | 0.8647 | 0.8336 | 0.8254 | 0.8418 | 0.8862 | 0.9650 | 1.088 |
| 9.0 | 0.6979 | 0.6777 | 0.6777 | 0.6998 | 0.7479 | 0.8286 | 0.9521 |

(D) The use of the equations in clause (B) results in the following CCCs for total ammonia (as N) at different temperatures and pHs:

Table 8-8

Criterion Continuous Concentrations for

Total Ammonia (as N)

Temperature (☜C)

| pH | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|---|---|
| 6.5 | 2.473 | 2.310 | 2.191 | 2.106 | 2.052 | 2.025 | 2.022 |
| 6.6 | 2.473 | 2.311 | 2.191 | 2.107 | 2.053 | 2.026 | 2.023 |
| 6.7 | 2.473 | 2.311 | 2.191 | 2.107 | 2.054 | 2.027 | 2.025 |
| 6.8 | 2.473 | 2.311 | 2.192 | 2.108 | 2.055 | 2.028 | 2.027 |
| 6.9 | 2.474 | 2.312 | 2.193 | 2.109 | 2.056 | 2.030 | 2.030 |
| 7.0 | 2.474 | 2.312 | 2.193 | 2.110 | 2.058 | 2.033 | 2.033 |
| 7.1 | 2.475 | 2.313 | 2.195 | 2.112 | 2.060 | 2.036 | 2.037 |
| 7.2 | 2.475 | 2.314 | 2.196 | 2.114 | 2.063 | 2.040 | 2.043 |
| 7.3 | 2.476 | 2.315 | 2.198 | 2.116 | 2.066 | 2.044 | 2.050 |
| 7.4 | 2.477 | 2.317 | 2.200 | 2.119 | 2.070 | 2.050 | 2.058 |
| 7.5 | 2.478 | 2.319 | 2.202 | 2.123 | 2.075 | 2.058 | 2.069 |
| 7.6 | 2.480 | 2.321 | 2.206 | 2.128 | 2.082 | 2.067 | 2.082 |
| 7.7 | 2.450 | 2.294 | 2.181 | 2.106 | 2.063 | 2.052 | 2.071 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7.8 | 2.092 | 1.959 | 1.865 | 1.802 | 1.769 | 1.763 | 1.785 |
| 7.9 | 1.767 | 1.657 | 1.578 | 1.527 | 1.502 | 1.501 | 1.525 |
| 8.0 | 1.481 | 1.389 | 1.325 | 1.285 | 1.266 | 1.269 | 1.295 |
| 8.1 | 1.179 | 1.107 | 1.057 | 1.027 | 1.016 | 1.022 | 1.049 |
| 8.2 | 0.9387 | 0.8828 | 0.8450 | 0.8232 | 0.8169 | 0.8263 | 0.8531 |
| 8.3 | 0.7481 | 0.7048 | 0.6762 | 0.6610 | 0.6589 | 0.6705 | 0.6976 |
| 8.4 | 0.5968 | 0.5634 | 0.5421 | 0.5321 | 0.5334 | 0.5468 | 0.5741 |
| 8.5 | 0.4766 | 0.4511 | 0.4357 | 0.4298 | 0.4337 | 0.4485 | 0.4760 |
| 8.6 | 0.3811 | 0.3619 | 0.3511 | 0.3485 | 0.3545 | 0.3704 | 0.3981 |
| 8.7 | 0.3052 | 0.2910 | 0.2839 | 0.2839 | 0.2916 | 0.3083 | 0.3362 |
| 8.8 | 0.2450 | 0.2347 | 0.2305 | 0.2326 | 0.2417 | 0.2591 | 0.2871 |
| 8.9 | 0.1971 | 0.1900 | 0.1881 | 0.1919 | 0.2020 | 0.2199 | 0.2480 |
| 9.0 | 0.1591 | 0.1545 | 0.1545 | 0.1595 | 0.1705 | 0.1889 | 0.2170 |

(d) This subsection establishes water quality for cold water fish. The waters listed in section 5(a)(2) of this rule are designated as salmonid waters and shall be protected for cold water fish. In addition to subsections (b) and (c), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold water fish community and are applicable at any point in the waters outside of the applicable mixing zone:

(1) Dissolved oxygen concentrations shall not be less than six (6.0) milligrams per liter at any time and shall not be less than seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted. Dissolved oxygen concentrations in the open waters of Lake Michigan shall not be less than seven (7.0) milligrams per liter at any time.

(2) The maximum temperature rise above natural shall not exceed two degrees Fahrenheit (2℉) (one and one-tenth degree Celsius (1.1℃)) at any time or place nor, unless due to natural causes, shall the temperature exceed the following:

(A) Seventy degrees Fahrenheit (70℉) (twenty-one and one-tenth degrees Celsius (21.1℃)) at any time.

(B) Sixty-five degrees Fahrenheit (65℉) (eighteen and three-tenths degrees Celsius (18.3℃)) during spawning or imprinting periods.

(e) This subsection establishes bacteriological quality for recreational uses as follows:

(1) In addition to subsection (b), the criteria in this subsection shall be used:

(A) to evaluate waters for full body contact recreational uses;

(B) to establish wastewater treatment requirements; and

(C) to establish effluent limits during the recreational season, which is defined as the months of April through October, inclusive.

(2) E. coli bacteria, using membrane filter (MF) count, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period.

(f) This subsection establishes surface water quality for public water supplies. In addition to subsection (b), the following standards are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:

(1) The coliform bacteria group shall not exceed the following:

(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).

(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.

(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples

examined during any month.

(2) Taste and odor producing substances, other than those naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of coagulation, sedimentation, filtration, and disinfection.

(3) The concentrations of either chlorides or sulfates shall not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) Surface waters shall be considered acceptable for public supplies if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.

(5) The combined concentration of nitrate-N and nitrite-N shall not exceed ten (10) milligrams per liter, and the concentration of nitrite-N shall not exceed one (1) milligram per liter.

(6) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(g) This subsection establishes water quality for industrial water supply. In addition to subsection (b), the standard to ensure protection of water quality at the point at which water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeters (at twenty-five degrees Celsius (25☜C)) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(h) This subsection establishes water quality for agricultural uses. The standards to ensure water quality conditions necessary for agricultural use are the same as those in subsection (b).

(i) This subsection establishes water quality for limited uses. The quality of waters designated for limited uses under section 19(a) of this rule shall, at a minimum, meet the following criteria:

(1) The criteria contained in subsection (b).

(2) The criteria contained in subsection (e).

(3) The criteria contained in subsection (g).

(4) The waters must be aerobic at all times.

(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable to the higher use water.

(j) Additional requirements for the open waters of Lake Michigan are as follows:

(1) In addition to complying with all other applicable subsections, open waters in Lake Michigan shall meet the following criteria:

Table 8-9

Additional Criteria for Lake Michigan

| Parameters | Criteria |
|---|---|
| Dissolved oxygen | Dissolved oxygen concentrations shall not be less than seven (7.0) milligrams per liter at any time at all places outside the applicable mixing zone. |
| pH | No pH values below six (6.0) nor above nine (9.0), except daily fluctuations that exceed pH 9.0 and are correlated with photosynthetic activity, shall be permitted. |
| Chlorides | 860 mg/l criterion maximum concentration |
| | 230 mg/l criterion continuous concentration |
| Phenols | See subsection (c)(1) |
| Sulfates | 250 mg/l[1] |
| Total phosphorus | See 327 IAC 5-10-2 |
| Total dissolved solids | 750 mg/l[1] |
| Fluorides | 1.0 mg/l[1] |
| Dissolved iron | 300 µg/l[1] |

[1]The above-noted criteria are established to minimize or prevent increased levels of these substances in Lake Michigan. For the purposes of establishing water quality-based effluent limitations based on the above-noted criteria, they shall be treated as four (4) day average criteria.

(2) During each triennial review of the water quality standards, prior to preliminary adoption of revised rules, the department shall prepare a report for the board on the monitoring data for the constituents in the following table (Table 8-10), as measured at the drinking water intakes in Lake Michigan. If these data indicate that the levels of the constituents are either increasing or exceed the levels in the table, the report shall provide available information on the known and potential causes of the increased levels of these parameters, the known and potential impacts on aquatic life, wildlife, and human health, and any recommended revisions of the criteria.

Table 8-10

| Parameters | Levels |
|---|---|
| pH | 7.5-8.5 s.u. |
| Chlorides | |
| Monthly average | 15 mg/l |
| Daily maximum | 20 mg/l |
| Sulfates | |
| Monthly average | 26 mg/l |
| Daily maximum | 50 mg/l |
| Total phosphorus | |
| Monthly average | 0.03 mg/l |
| Daily maximum | 0.04 mg/l |
| Total dissolved solids | |
| Monthly average | 172 mg/l |
| Daily maximum | 200 mg/l |

(k) The following table is for reference only to facilitate the comparison of the former water quality criteria with water quality criteria developed using the methodologies within this rule; these former water quality criteria shall not be used to establish water quality-based permit limits:

Table 8-11

| Substances | Acute Aquatic Life | Chronic | | |
|---|---|---|---|---|
| | | Outside of Mixing Zone | | Point of Water Intake |
| | | Chronic Aquatic Life | Human Health | Human Health |
| Metals (µg/l) | | | | |
| (Acid soluble, except as indicated) | | | | |
| Antimony | | | 45,000 (T) | 146 (T) |
| Arsenic (III) | | | 0.175 (C) | 0.022 (C) |
| Barium | | | | 1,000 (D) |
| Beryllium | | | 1.17 (C) | 0.068 (C) |

| | | | | |
|---|---|---|---|---|
| Cadmium | | | | 10 (D) |
| Chromium (III) | | | 3,433,000 (T) | 170,000 (T) |
| Chromium (VI) | | | | 50 (D) |
| Lead | $e^{(1.273\ [1n\ Hard]-1.460)}$ | $e^{(1.273\ [1n\ Hard]-4.705)}$ | | 50 (D) |
| Nickel | | | 100 (T) | 13.4 (T) |
| Selenium | | | | 10 (D) |
| Silver | $e^{(1.72[ln\ Hard]-6.52)}/2$ | | | 50 (D) |
| Thallium | | | 48 (T) | 13 (T) |
| Organics (µg/l) | | | | |
| Acrolein | | | 780 (T) | 320 (T) |
| Acrylonitrile | | | 6.5 (C) | 0.58 (C) |
| Aldrin | 1.5 | | 0.00079 (C) | 0.00074 (C) |
| Benzidine | | | 0.0053 (C) | 0.0012 (C) |
| Carbon Tetrachloride | | | 69.4 (C) | 4.0 (C) |
| Chlordane | 1.2 | 0.0043 | | |
| Chlorinated Benzenes | | | | |
| 1,2,4,5-Tetrachlorobenzene | | | 48 (T) | 38 (T) |
| Pentachlorobenzene | | | 85 (T) | 74 (T) |
| Hexachlorobenzene | | | 0.0074 (C) | 0.0072 (C) |
| Chlorinated Ethanes | | | | |
| 1,2-dichloroethane | | | 2,430 (C) | 9.4 (C) |
| 1,1,1-trichloroethane | | | 1,030,000 (T) | 18,400 (T) |
| 1,1,2-trichloroethane | | | 418 (C) | 6.0 (C) |
| 1,1,2,2,-tetrachloroethane | | | 107 (C) | 1.7(C) |
| Chlorinated Phenols | | | | |
| 2,4,5-trichlorophenol | | | | 2,600 (T) |
| 2,4,6-trichlorophenol | | | 36 (C) | 12 (C) |
| Chloroalkyl Ethers | | | | |
| bis(2-chloroisopropyl) ether | | | 4,360 (T) | 34.7 (T) |
| bis(chloromethyl) ether | | | 0.018 (C) | 0.000038 (C) |
| bis(2-chloroethyl) ether | | | 13.6 (C) | 0.3 (C) |
| Chloroform | | | 157 (C) | 1.9 (C) |

| | | | | |
|---|---|---|---|---|
| Chlorpyrifos | 0.083 | 0.041 | | |
| DDT | 0.55 | 0.001 | | |
| Dichlorobenzenes | | | 2,600 (T) | 400 (T) |
| Dichlorobenzidine | | | 0.2 (C) | 0.1 (C) |
| 1,1-dichloroethylene | | | 18.5 (C) | 0.33 (C) |
| 2,4-dichlorophenol | | | | 3,090 (T) |
| Dichloropropenes | | | 14,100 (T) | 87 (T) |
| 2,4-dinitrotoluene | | | 91 (C) | 1.1 (C) |
| 1,2-diphenylhydrazine | | | 5.6 (C) | 0.422 (C) |
| Endosulfan | 0.11 | 0.056 | 159 (T) | 74 (T) |
| Endrin | | | | 1.0 (D) |
| Ethylbenzene | | | 3,280 (T) | 1,400 (T) |
| Fluoranthene | | | 54 (T) | 42 (T) |
| Halomethanes | | | 157 (C) | 1.9 (C) |
| Heptachlor | 0.26 | 0.0038 | 0.0028 (C) | 0.0028 (C) |
| Hexachlorobutadiene | | | 500 (C) | 4.47 (C) |
| Hexachlorocyclohexane (HCH) | | | | |
| alpha HCH | | | 0.31 (C) | 0.09 (C) |
| beta HCH | | | 0.55 (C) | 0.16 (C) |
| gamma HCH (Lindane) | 1.0 | 0.08 | 0.63 (C) | 0.19 (C) |
| Technical HCH | | | 0.41 (C) | 0.12 (C) |
| Hexachlorocyclopentadiene | | | | 206 (T) |
| Isophorone | | | 520,000 (T) | 5,200 (T) |
| Nitrobenzene | | | | 19,800 (T) |
| 4,6-dinitro-o-cresol | | | 765 (T) | 13.4 (T) |
| Nitrosamines | | | | |
| N-nitrosodiethylamine | | | 12.4 (C) | 0.008 (C) |
| N-nitrosodimethylamine | | | 160 (C) | 0.014 (C) |
| N-nitrosodibutylamine | | | 5.9 (C) | 0.064 (C) |
| N-nitrosodiphenylamine | | | 161 (C) | 49 (C) |
| N-nitrosopyrrolidine | | | 919 (C) | 0.16 (C) |
| Pentachlorophenol | | | | 1,000 (T) |

| | | | | |
|---|---|---|---|---|
| Phenol | | | | 3,500 (T) |
| Phthalate Esters | | | | |
| Dimethyl phthalate | | | 2,900,000 (T) | 313,000 (T) |
| Diethyl phthalate | | | 1,800,000 (T) | 350,000 (T) |
| Dibutyl phthalate | | | 154,000 (T) | 34,000 (T) |
| Di-2-ethylhexyl phthalate | | | 50,000 (T) | 15,000 (T) |
| Polychlorinated Biphenyls (PCBs) | | 0.014 | 0.00079 (C) | 0.00079 (C) |
| Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs) | | | 0.31 (C) | 0.028 (C) |
| Tetrachloroethylene | | | 88.5 (C) | 8 (C) |
| Toxaphene | 0.73 | 0.0002 | | |
| Vinyl Chloride | | | 5,246 (C) | 20 (C) |
| Other Substances | | | | |
| Asbestos (fibers/liter) | | | | 300,000 (C) |
| Nitrate-N + Nitrite-N (mg/l) | | | | 10 (D) |
| Nitrite-N (mg/l) | | | | 1.0 (D) |

Dissolved solids shall not exceed 750 mg/l in all waters.

Fluoride shall not exceed 2.0 mg/l in all waters.

Sulfates shall not exceed 250 mg/l in all waters.

NOTES:

(T) derived from threshold toxicity.

(C) derived from nonthreshold cancer risk.

(D) derived from drinking water standards, equal to or less than threshold toxicity.

(l) The department shall calculate additional criteria or values as follows:
(1) The department shall calculate Tier I criteria or Tier II values (Tier I criteria will be calculated whenever sufficient data are available) using the methodologies under sections 11 through 15 of this rule, and shall publish them in the Indiana Register by July 1, 1997, for the following parameters:

Table 8-12

| Parameter | Criteria or Values to be Calculated |
|---|---|
| Acenaphthene | Aquatic life and human health |
| Acenaphthylene | Aquatic life[1] and human health[1] |
| Aldrin | Aquatic life, human health, and wildlife |
| Aluminum | Aquatic life and human health |
| Anthracene | Aquatic life and human health |

| | |
|---|---|
| Arsenic | Human health |
| Benzene | Aquatic life |
| Benzo(a)anthracene | Aquatic life and human health[1] |
| Benzo(a)Pyrene | Aquatic life and human health[1] |
| Benzo(b)fluoranthene | Aquatic life and human health[1] |
| bis(2-ethylhexyl) phthalate | Aquatic life and human health |
| Cadmium | Human health |
| Chloroform | Aquatic life and human health |
| Chromium, Trivalent | Human health |
| Chromium, Hexavalent | Human health |
| Chrysene | Aquatic life[1] and human health[1] |
| DDT | Aquatic life |
| Dibenzofuran | Aquatic life and human health |
| Ethylbenzene | Aquatic life and human health |
| Ethylene glycol | Aquatic life and human health |
| Fluoranthene | Aquatic life and human health |
| Fluorene | Aquatic life and human health |
| Fluoride | Aquatic life and human health[1] |
| Iron | Aquatic life |
| Lead | Aquatic life and human health |
| Manganese | Aquatic life and human health |
| 2-Methylnaphthalene | Aquatic life[1] and human health |
| Methylene chloride | Aquatic life |
| Methyl tert-Butyl Ether | Aquatic life and human health |
| Naphthalene | Aquatic life and human health |
| Nickel | Human health |
| Phenanthrene | Aquatic life and human health |
| Pyrene | Aquatic life[1] and human health |
| Selenium | Acute aquatic life and human health |
| Silver | Aquatic life and human health |
| Tetrachloroethylene | Aquatic life and human health |
| Toluene | Aquatic life |

| | |
|---|---|
| 1,1,1-Trichloroethane | Aquatic life and human health |
| 1,3,5-Trimethylbenzene | Aquatic life[1] and human health |
| Xylene | Aquatic life[1] and human health |

[1]For the above-noted criteria, insufficient data are available to calculate Tier I criteria and Tier II values at this time. Unless data become available by May 1, 1997, IDEM may not be able to develop the above-noted criteria by July 1, 1997.

(2) By July 1, 1997, the department shall develop a schedule for determining criteria or values for the parameters that have criteria under 327 IAC 2-1-6, Table 1 that do not have criteria in this rule and for which criteria or values have not been calculated under subdivision (1).

*(Water Pollution Control Board; 327 IAC 2-1.5-8; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-9 Interim ground water quality standards *(Repealed)*

Sec. 9. *(Repealed by Water Pollution Control Board; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1882)*

327 IAC 2-1.5-10 Methods of analysis

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 10. The analytical procedures used as methods of analysis to determine the chemical, bacteriological, biological, and radiological quality of waters sampled shall be in accordance with 40 CFR 136, Standard Methods for the Examination of Water and Wastewater, or methods approved by the commissioner. *(Water Pollution Control Board; 327 IAC 2-1.5-10; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1381)*

327 IAC 2-1.5-11 Determination of Tier I aquatic life criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18

Sec. 11. (a) The procedures in this section shall be used to determine acute and chronic Tier I aquatic life criteria.

(b) The following considerations regarding the toxic substance shall be considered during the development of criteria or values:

(1) Each separate chemical that does not ionize substantially in most natural bodies of water should usually be considered a separate substance, except possibly for structurally similar organic compounds that only exist in large quantities as commercial mixtures of the various compounds and apparently have similar biological, chemical, physical, and toxicological properties.

(2) For chemicals that ionize substantially in most natural bodies of water, for example:

(A) some phenols and organic acids;

(B) some salts of phenols and organic acids; and

(C) most inorganic salts and coordination complexes of metals and metalloid;

all forms that would be in chemical equilibrium should usually be considered one (1) substance. Each different oxidation state of a metal and each different nonionizable covalently bonded organometallic compound should usually be considered a separate substance.

(3) The definition of the toxic substance should include an operational analytical component. Identification of a substance simply as sodium, for example, implies total sodium, but leaves room for doubt. If total is meant, it must be explicitly stated. Even total has different operational definitions, some of which do not necessarily measure all that is there in all samples. Thus, it is also necessary to reference or describe the analytical method that is intended. The selection of the operational analytical component should take into account the analytical and environmental chemistry of the material and various practical considerations, such as labor and equipment requirements, and whether the method would require measurement in the field or would allow measurement after samples are transported to a laboratory.

(A) The primary requirements of the operational analytical component shall be as follows:

(i) Appropriate for use on samples of receiving water.

(ii) Rarely result in underprotection or overprotection of aquatic organisms and their uses.

(iii) Compatible with the available toxicity and bioaccumulation data without making extrapolations that are too hypothetical. Toxicity is the property of a substance, or combination of substances, to adversely affect organisms.

(B) Because an ideal analytical measurement will rarely be available, an appropriate compromise measurement will usually have to be used. This compromise measurement must fit with the general approach that if an ambient concentration is lower than the criterion, unacceptable effects will probably not occur, that is, the compromise measure must not err on the side of underprotection when measurements are made on a surface water. What is an appropriate measurement in one (1) situation might not be appropriate for another. For example, because the chemical and physical properties of an effluent are usually quite different from those of the receiving water, an analytical method that is appropriate for analyzing an effluent might not be appropriate for expressing a criterion, and vice versa. A criterion should be based on an appropriate analytical measurement, but the criterion is not rendered useless if an ideal measurement either is not available or is not feasible. The analytical chemistry of the substance might have to be taken into account when defining the substance or when judging the acceptability of some toxicity tests, but a criterion must not be based on the sensitivity of an analytical method. When aquatic organisms are more sensitive than routine analytical methods, the proper solution is to develop better analytical methods.

(4) The use of dissolved metal to set and measure compliance with water quality standards for aquatic life is the recommended approach, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal. One (1) reason is that a primary mechanism for water column toxicity is adsorption at the gill surface that requires metals to be in the dissolved form. Reasons for the consideration of total recoverable metals criteria include risk management considerations not covered by evaluation of water column toxicity. The commissioner may, after considering sediment and food chain effects for a particular metal, decide to take a more conservative approach for the metal since metals are elements, hence persistent. This approach could include the use of total recoverable metal in the development of a water quality criterion for a specific metal.

(c) The following data collection procedures shall be followed when developing Tier I aquatic life criteria:

(1) Collect all data available on the substance concerning toxicity to aquatic animals and plants.

(2) All data that are used should be available in typed, dated, and signed hard copy, for example:

(A) publication;

(B) manuscript;

(C) letter; or

(D) memorandum;

with enough supporting information to indicate that acceptable test procedures were used and that the results are reliable. In some cases, it may be appropriate to obtain written information from the investigator, if possible. Information that is not available for distribution shall not be used.

(3) Questionable data, whether published or unpublished, shall not be used. For example, data shall be rejected if they are from tests:

(A) that did not contain a control treatment;

(B) in which too many organisms in the control treatment died or showed signs of stress or disease; and

(C) in which distilled or deionized water was used as the dilution water without the addition of appropriate salts.

(4) Data on technical grade materials may be used if appropriate, but data on formulated mixtures and emulsifiable concentrates of the material shall not be used.

(5) For some highly volatile, hydrolyzable, or degradable materials, it may be appropriate to use only results of flow-through tests in which the concentrations of test material in test solutions were measured using acceptable analytical methods. A flow-through test is a test with aquatic organisms in which test solutions flow into constant-volume test chambers either intermittently, for example, every few minutes, or continuously, with the excess flowing out.

(6) Data shall be rejected if obtained using the following:

(A) Brine shrimp, because they usually only occur naturally in water with salinity greater than thirty-five (35) grams per kilogram.

(B) Species that do not have reproducing wild populations in North America.

(C) Organisms that were previously exposed to substantial concentrations of the test material or other contaminants.

(D) Saltwater species except for use in deriving acute-chronic ratio (ACR).

(7) Questionable data, data on formulated mixtures and emulsifiable concentrates, and data obtained with species nonresident to North America or previously exposed organisms may be used to provide auxiliary information but shall not be used in the derivation of criteria.

(d) This subsection establishes the data requirements for the development of Tier I aquatic life criteria as follows:
(1) Certain data should be available to help ensure that each of the major kinds of possible adverse effects receives adequate consideration. An adverse effect is a change in an organism that is harmful to the organism. Exposure means contact with a chemical or physical agent. Results of acute and chronic toxicity tests with representative species of aquatic animals are necessary so that data available for tested species can be considered a useful indication of the sensitivities of appropriate untested species. Fewer data concerning toxicity to aquatic plants are usually available because procedures for conducting tests with plants and interpreting the results of such tests are not as well developed.
(2) To derive a Great Lakes Tier I criterion for aquatic organisms and their uses, the following must be available:

(A) Results of acceptable acute (or chronic) tests (see subsections (e) and (g)) with at least one (1) species of freshwater animal in at least eight (8) different families such that all of the following are included:

(i) The family Salmonidae in the class Osteichthyes.

(ii) One (1) other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes, for example:

(AA) bluegill; or

(BB) channel catfish.

(iii) A third family in the phylum Chordata, for example:

(AA) fish; or

(BB) amphibian.

(iv) A planktonic crustacean, for example:

(AA) a cladoceran; or

(BB) copepod.

(v) A benthic crustacean, for example:

(AA) ostracod;

(BB) isopod;

(CC) amphipod; or

(DD) crayfish.

(vi) An insect, for example:

(AA) mayfly;

(BB) dragonfly;

(CC) damselfly;

(DD) stonefly;

(EE) caddisfly;

(FF) mosquito; or

(GG) midge.

(vii) A family in a phylum other than Arthropoda or Chordata, for example:

(AA) Rotifera;

(BB) Annelida; or

(CC) Mollusca.

(viii) A family in any order of insect or any phylum not already represented.

(B) Acute-chronic ratios (see subsection (g)) with at least one (1) species of aquatic animal in at least three (3) different families provided that of the three (3) species:

(i) at least one (1) is a fish;

(ii) at least one (1) is an invertebrate; and

(iii) at least one (1) species is an acutely sensitive freshwater species (the other two (2) may be saltwater species).

(C) Results of at least one (1) acceptable test with a freshwater algae or vascular plant is desirable but not required for criterion derivation (see subsection (i)). If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) should also be available.

(3) If all required data are available, a numerical criterion can usually be derived except in special cases. For example, derivation of a chronic criterion might not be possible if the available ACRs vary by more than a factor of ten (10) with no apparent pattern. Also, if a criterion is to be related to a water quality characteristic (see subsections (f) and (h)), more data will be required.
(4) Confidence in a criterion usually increases as the amount of available pertinent information increases. Thus, additional data are usually desirable.
(e) The following procedures shall be used to calculate a final acute value (FAV):
(1) Appropriate measures of the acute (short term) toxicity of the material to a variety of species of aquatic animals are

used to calculate the FAV. The calculated FAV is a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher genus mean acute values (GMAVs). An acute test is a comparative study in which organisms, that are subjected to different treatments, are observed for a short period usually not constituting a substantial portion of their life span. However, in some cases, the species mean acute value (SMAV) of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FAV, then the SMAV replaces the calculated FAV in order to provide protection for that important species.

(2) Acute toxicity tests shall be conducted in accordance with this subsection.

(3) Except for results with saltwater annelids and mysids, results of acute tests during which the test organisms were fed should not be used, unless data indicate that the food did not affect the toxicity of the test material. (If the minimum acute-chronic ratio data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used.)

(4) Results of acute tests conducted in unusual dilution water, for example, dilution water in which total organic carbon or particulate matter exceeded five (5) milligrams per liter, shall not be used, unless a relationship is developed between acute toxicity and organic carbon or particulate matter, or unless data show that the organic carbon or particulate matter do not affect toxicity.

(5) Acute values must be based upon endpoints which reflect the total severe adverse impact of the test material on the organisms used in the test. Therefore, only the following kinds of data on acute toxicity to aquatic animals shall be used:

(A) Tests with daphnids and other cladocerans must be started with organisms less than twenty-four (24) hours old and tests with midges must be started with second or third instar larvae. It is preferred that the results should be the forty-eight (48) hour $EC_{50}$ based on the total percentage of organisms killed and immobilized. If such an $EC_{50}$ is not available for a test, the forty-eight (48) hour $LC_{50}$ should be used in place of the desired forty-eight (48) hour $EC_{50}$. An $EC_{50}$ or $LC_{50}$ of longer than forty-eight (48) hours can be used as long as the animals were not fed and the control animals were acceptable at the end of the test.

(B) It is preferred that the results of a test with embryos and larvae of barnacles, bivalve molluscs (clams, mussels, oysters, and scallops), sea urchins, lobsters, crabs, shrimp, and abalones be the ninety-six (96) hour $EC_{50}$ based on the percentage of organisms with incompletely developed shells plus the percentage of organisms killed. If such an $EC_{50}$ is not available from a test, of the values that are available from the test, the lowest of the following should be used in place of the desired ninety-six (96) hour $EC_{50}$:

(i) Forty-eight (48) to ninety-six (96) hour $EC_{50}$s based on percentage of organisms with incompletely developed shells plus percentage of organisms killed.

(ii) Forty-eight (48) to ninety-six (96) hour $EC_{50}$s based upon percentage of organisms with incompletely developed shells.

(iii) Forty-eight (48) hour to ninety-six (96) hour $LC_{50}$s.

If the minimum acute-chronic ratio data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used.

(C) It is preferred that the result of tests with all other aquatic animal species and older life stages of barnacles, bivalve molluscs (clams, mussels, oysters, and scallops), sea urchins, lobsters, crabs, shrimp, and abalones be the ninety-six (96) hour $EC_{50}$ based on percentage of organisms exhibiting loss of equilibrium plus percentage of organisms immobilized plus percentage of organisms killed. If such an $EC_{50}$ is not available from a test, of the values that are available from a test, the lower of the following should be used in place of the desired ninety-six (96) hour $EC_{50}$:

(i) The ninety-six (96) hour $EC_{50}$ based on percentage of organisms exhibiting loss of equilibrium plus percentage of organisms immobilized.

(ii) The ninety-six (96) hour $LC_{50}$.

(D) Tests results that take into account the number of young produced, such as most tests with protozoans, are not considered acute tests, even if the duration was ninety-six (96) hours or less.

(E) If the tests were conducted properly, acute values reported as greater than values and those that are above the solubility of the test material should be used, because rejection of such acute values would bias the final acute value by eliminating acute values for resistant species.

(6) If the acute toxicity of the material to aquatic animals has been shown to be related to a water quality characteristic, such as hardness or particulate matter for freshwater animals, refer to subsection (f).

(7) The agreement of the data within and between species must be considered. Acute values that appear to be questionable in comparison with other acute and chronic data for the same species and for other species in the same genus must not be used. For example, if the acute values available for a species or genus differ by more than a factor of

ten (10), rejection of some or all of the values would be appropriate, absent countervailing circumstances.

(8) If the available data indicate that one (1) or more life stages are at least a factor of two (2) more resistant than one (1) or more other life stages of the same species, the data for the more resistant life stages shall not be used in the calculation of the SMAV because a species cannot be considered protected from acute toxicity if all of the life stages are not protected.

(9) For each species for which at least one (1) acute value is available, the SMAV shall be calculated as the geometric mean of the results of all acceptable flow-through acute toxicity tests in which the concentrations of test material were measured with the most sensitive tested life stage of the species. For a species for which no such result is available, the SMAV shall be calculated as the geometric mean of all acceptable acute toxicity tests with the most sensitive tested life stage, for example, results of flow-through tests in which the concentrations were not measured and results of static and renewal tests based on initial concentrations (nominal concentrations are acceptable for most test materials if measured concentrations are not available) of test material. A renewal test is a test with aquatic organisms in which either the test solution in a test chamber is removed and replaced at least once during the test or the test organisms are transferred into a new test solution of the same composition at least once during the test. A static test is a test with aquatic organisms in which the solution and organisms that are in a test chamber at the beginning of the test remain in the chamber until the end of the test, except for removal of dead test organisms. The following conditions are applicable to this calculation:

(A) Data reported by original investigators must not be rounded off. Results of all intermediate calculations must not be rounded off to fewer than four (4) significant digits.

(B) The geometric mean of N numbers is the Nth root of the product of the N numbers. Alternatively, the geometric mean can be calculated by adding the logarithms of the N numbers, dividing the sum by N, and taking the antilog of the quotient. The geometric mean of two (2) numbers is the square root of the product of the two (2) numbers, and the geometric mean of one (1) number is that number. Either natural (base e) or common (base 10) logarithms can be used to calculate geometric means as long as they are used consistently within each set of data, for example, the antilog used must match the logarithms used.

(C) Geometric means, rather than arithmetic means, are used here because the distributions of sensitivities of individual organisms in toxicity tests on most materials and the distributions of sensitivities of species within a genus are more likely to be lognormal than normal. Similarly, geometric means are used for ACRs because quotients are likely to be closer to lognormal than normal distributions. In addition, division of the geometric mean of a set of numerators by the geometric mean of the set of denominators will result in the geometric mean of the set of corresponding quotients.

(10) For each genus for which one (1) or more SMAVs are available, the GMAV shall be calculated as the geometric mean of the SMAVs available for the genus.

(11) Order the GMAVs from high to low.

(12) Assign ranks, R, to the GMAVs from "1" for the lowest to "N" for the highest. If two (2) or more GMAVs are identical, assign them successive ranks.

(13) Calculate the cumulative probability, P, for each GMAV as R/(N + 1).

(14) Select the four (4) GMAVs which have cumulative probabilities closest to five-hundredths (0.05) (if there are fewer than fifty-nine (59) GMAVs, these will always be the four (4) lowest GMAVs).

(15) Using the four (4) selected GMAVs and Ps, calculate:

(A)

```
func {FAV~ =~ e sup A}
```

(B)

```
func{A~    =~     S`(`root { `0.05}```)+`L}
```

(C)

```
func{L~=~ {sum(ln`` GMAV)~ -~ S`(sum  (sqrt P))` } over 4}
```

(D)

```
func{S sup 2~ =~ { SUM ( (ln`` GMAV)sup 2)~ -~
{(sum  (ln`` GMAV)) sup 2} over 4} over
{sum (P)~ -~ {(sum ( sqrt  P)) sup 2} over 4} }
```

(16) If for a commercially or recreationally important species of the Great Lakes system the geometric mean of the acute values from flow-through tests in which the concentrations of test material were measured is lower than the calculated FAV, then that geometric mean must be used as the FAV instead of the calculated FAV.

(f) When enough data are available to show that acute toxicity to two (2) or more species is similarly related to a water quality characteristic, the relationship shall be taken into account as described in subdivisions (1) through (6) or using analysis of covariance. The two (2) methods are equivalent and produce identical results. The manual method described in this subsection provides an understanding of this application of covariance analysis, but computerized versions of covariance analysis are much more convenient for analyzing large data sets. If two (2) or more factors affect toxicity, multiple regression analysis shall be used. An acute criterion based on a water quality characteristic shall be determined as follows:

(1) For each species for which comparable acute toxicity values are available at two (2) or more different values of the water quality characteristic, perform a least squares regression of the acute toxicity values on the corresponding values of the water quality characteristic to obtain the slope and its ninety-five percent (95%) confidence limits for each species. (Because the best documented relationship is that between hardness and acute toxicity of metals in fresh water and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this section. For relationships based on other water quality characteristics, such as pH, temperature, no transformation or a different transformation might fit the data better, and appropriate changes will be necessary throughout this section.)

(2) Decide whether the data for each species are relevant, taking into account the range and number of the tested values of the water quality characteristic and the degree of agreement within and between species. For example, a slope based on six (6) data points might be of limited value if it is based only on data for a very narrow range of values of the water quality characteristic. A slope based on only two (2) data points, however, might be useful if it is consistent with other information and if the two (2) points cover a broad enough range of the water quality characteristic. In addition, acute values that appear to be questionable in comparison with other acute and chronic data available for the same species and for other species in the same genus should not be used. For example, if after adjustment for the water quality characteristic, the acute values available for a species or genus differ by more than a factor of ten (10), rejection of some or all of the values would be appropriate, absent countervailing justification. If useful slopes are not available for at least one (1) fish and one (1) invertebrate or if the available slopes are too dissimilar or if too few data are available to adequately define the relationship between acute toxicity and the water quality characteristic, return to subsection (e)(7), using the results of tests conducted under conditions and in waters similar to those commonly used for toxicity tests with the species.

(3) For each species, calculate the geometric mean of the available acute values and then divide each of the acute values for the species by the geometric mean for the species. This normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is one (1.0).

(4) Similarly normalize the values of the water quality characteristic for each species individually using the procedure in subdivisions (1) through (3).

(5) Individually for each species perform a least squares regression of the normalized acute values of the water quality characteristic. The resulting slopes and ninety-five percent (95%) confidence limits will be identical to those obtained in subdivision (1). If, however, the data are actually plotted, the line of best fit for each individual species will go through the point 1,1 in the center of the graph.

(6) Treat all of the normalized data as if they were all for the same species and perform a least squares regression of all of the normalized acute values on the corresponding normalized values of the water quality characteristic to obtain the pooled acute slope, V, and its ninety-five percent (95%) confidence limits. If all of the normalized data are actually plotted, the line of best fit will go through the point 1,1 in the center of the graph.

(7) For each species calculate the geometric mean, W, of the acute toxicity values and the geometric mean, X, of the values of the water quality characteristic. (These were calculated in subdivisions (3) and (4)).

(8) For each species, calculate the logarithm, Y, of the SMAV at a selected value, Z, of the water quality characteristic using the equation:

$$Y = \ln W - V(\ln X - \ln Z)$$

(9) For each species calculate the SMAV at Z using the equation:

$$SMAV = e^{Y}$$

(10) Alternatively, the SMAVs at Z can be obtained by skipping the step in subdivision (7), using the equations in subdivisions (8) and (9) to adjust each acute value individually to Z, and then calculating the geometric mean of the adjusted values for each species individually. This alternative procedure allows an examination of the range of the adjusted acute values for each species.

(11) Obtain the FAV at Z by using the procedure described in subsection (e)(10) through (e)(15).

(12) If, for a commercially or recreationally important species of the Great Lakes system the geometric mean of the acute values at Z from flow-through tests in which the concentrations of the test material were measured is lower than the FAV at Z, then the geometric mean must be used as the FAV instead of the FAV calculated in subdivision (11).

(13) The Final Acute Equation is written as:

$$(FAV) = e^{(V[\ln(\text{water quality characteristic})] + A - V[\ln Z])}$$

Where: V = pooled acute slope.

A = ln(FAV at Z).

Because V, A, and Z are known, the FAV can be calculated for any selected value of the water quality characteristic.

(g) The following procedures shall be used to calculate a final chronic value (FCV):

(1) Depending on the data that are available concerning chronic toxicity to aquatic animals, the FCV can be calculated in the same manner as the FAV or by dividing the FAV by the final acute-chronic ratio (FACR). In some cases, it might not be possible to calculate a FCV. The FCV is one (1) of the following as applicable:

(A) A calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable chronic toxicity tests have been conducted on the material) have higher GMCVs.

(B) The quotient of an FAV divided by an appropriate ACR (ACR is a way of relating acute and chronic toxicities).

(C) The SMCV of an important or critical species, if the SMCV is lower than the calculated estimate or the quotient.

(2) Chronic values shall be based on results of flow-through (except renewal is acceptable for daphnids) chronic tests in which the concentrations of test material in the test solutions were properly measured at appropriate times during the test. A chronic test is a comparative study in which organisms, that are subjected to different treatments, are observed for a long period or a substantial portion of their life span.

(3) Results of chronic tests in which survival, growth, or reproduction in the control treatment was unacceptably low shall not be used. The limits of acceptability will depend on the species.

(4) Results of chronic tests conducted in unusual dilution water, for example, dilution water in which total organic carbon or particulate matter exceeded five (5) milligrams per liter, should not be used, unless a relationship is developed between chronic toxicity and organic carbon or particulate matter, or unless data show that the organic carbon or particulate matter do not affect toxicity.

(5) Chronic values must be based on endpoints and lengths of exposure appropriate to the species. Therefore, only results of the following kinds of chronic toxicity tests shall be used:

(A) Life-cycle toxicity tests consisting of exposures of each of two (2) or more groups of individuals of a species to a different concentration of the test material throughout a life cycle. To ensure that all life stages and life processes are exposed, the following procedures shall be followed:

(i) Tests with fish should begin with embryos or newly hatched young less than forty-eight (48) hours old, continue through maturation and reproduction, and should end not less than twenty-four (24) days (ninety (90) days for salmonids) after the hatching of the next generation. For fish, data should be obtained and analyzed on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability.

(ii) Tests with daphnids should begin with young less than twenty-four (24) hours old and last for not less than twenty-one (21) days, and for ceriodaphnids not less than seven (7) days. For daphnids, data should be obtained and analyzed on survival and young per female.

(iii) Tests with mysids should begin with young less than twenty-four (24) hours old and continue until seven (7) days past the median time of first brood release in the controls. For mysids, data should be obtained and analyzed on survival, growth, and young per female.

(B) Partial life-cycle toxicity tests consist of exposures of each of two (2) or more groups of individuals of a species of fish to a different concentration of the test material through most portions of a life cycle. Partial life-cycle tests are allowed with fish species that require more than a year to reach sexual maturity, so that all major life stages can be exposed to the test material in less than fifteen (15) months. A life-cycle test is a comparative study in which organisms, that are subjected to different treatments, are observed at least from a life stage in one (1) generation to the same life-stage in the next generation. Exposure to the test material should begin with immature juveniles at least two (2) months prior to active gonad development, continue through maturation and reproduction, and end not less than twenty-four (24) days (ninety (90) days for salmonids) after the hatching of the next generation. Data should be obtained and analyzed on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability.

(C) Early life-stage toxicity tests consisting of twenty-eight (28) to thirty-two (32) day (sixty (60) days post hatch for salmonids) exposures of the early life stages of a species of fish from shortly after fertilization

through embryonic, larval, and early juvenile development. Data should be obtained and analyzed on survival and growth. (Note: Results of an early life-stage test are used as predictions of results of life-cycle and partial life-cycle tests with the same species. Therefore, when results of a life-cycle or partial life-cycle test are available, results of an early life-stage test with the same species should not be used. Also, results of early life-stage tests in which the incidence of mortalities or abnormalities increased substantially near the end of the test shall not be used because the results of such tests are possibly not good predictions of comparable life-cycle or partial life-cycle tests.)

(6) A chronic value may be obtained by analyzing chronic data using regression analysis or by calculating the geometric mean of the lower and upper chronic limits from a chronic test as follows:

(A) A lower chronic limit is the highest tested concentration:

(i) in an acceptable chronic test;

(ii) which did not cause an unacceptable amount of adverse effect on any of the specified biological measurements; and

(iii) below which no tested concentration caused an unacceptable effect.

(B) An upper chronic limit is the lowest tested concentration:

(i) in an acceptable chronic test;

(ii) which did cause an unacceptable amount of adverse effect on one (1) or more of the specified biological measurements; and

(iii) above which all tested concentrations also caused such an effect.

(C) Because various authors have used a variety of terms and definitions to interpret and report results of chronic tests, reported results should be reviewed carefully. The amount of effect that is considered unacceptable is often based on a statistical hypothesis test, but might also be defined in terms of a specified percent reduction from the controls. A small percent reduction (for example, three percent (3%)) might be considered acceptable even if it is statistically significantly different from the control, whereas a large percent reduction (for example, thirty percent (30%)) might be considered unacceptable even if it is not statistically significant.

(7) If the chronic toxicity of the material to aquatic animals has been shown to be related to a water quality characteristic such as hardness or particulate matter for freshwater animals, refer to subsection (h).

(8) If chronic values are available for species in eight (8) families as described in subsection (d)(2)(A), a SMCV shall be calculated for each species for which at least one (1) chronic value is available by calculating the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests. Appropriate GMCVs shall also be calculated. A GMCV is the geometric mean of the SMCVs for the genus. The FCV shall be obtained using the procedure described in subsection (e)(10) through (e)(15), substituting SMCV and GMCV for SMAV and GMAV, respectively. See subdivision (10).

(9) The following procedures are for use when chronic values are not available for species in eight (8) taxonomic families as described in subsection (d)(2)(A):

(A) For each chronic value for which at least one (1) corresponding appropriate acute value is available, calculate an ACR, using for the numerator the geometric mean of the results of all acceptable flow-through (except static is acceptable for daphnids and midges) acute tests in the same dilution water in which the concentrations are measured. For fish, the acute tests should be conducted with juveniles. The acute tests should be part of the same study as the chronic test. If acute tests were not conducted as part of the same study, but were conducted as part of a different study in the same laboratory and dilution water, then they may be used. If no such acute tests are available, results of acute tests conducted in the same dilution water in a different laboratory may be used. If no such acute tests are available, an ACR shall not be calculated.

(B) For each species, calculate the SMACR as the geometric mean of all ACRs available for that species. If the minimum ACR data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used along with the freshwater data.

(C) For some materials, the ACR seems to be the same for all species, but for other materials the ratio seems to increase or decrease as the SMAV increases. Thus the FACR can be obtained in the following three (3) ways, depending on the data available (If the available SMACRs do not fit one (1) of these cases, a FACR may not be obtained and a Tier I FCV probably cannot be calculated.):

(i) If the species mean ACR seems to increase or decrease as the SMAVs increase, the FACR shall be calculated as the geometric mean of the ACRs for species whose SMAVs are close to the FAV.

(ii) If no major trend is apparent and the ACRs for all species are within a factor of ten (10), the FACR shall be calculated as the geometric mean of all of the SMACRs.

(iii) If the most appropriate SMACRs are less than two (2.0), and especially if they are less than one (1.0), acclimation has probably occurred during the chronic test. In this situation, because continuous exposure and acclimation cannot be assured to provide adequate protection in field situations, the FACR should be assumed to be two (2), so that the FCV is equal to the Criterion Maximum Concentration (CMC). (See subsection (k)(1).)

(D) Calculate the FCV by dividing the FAV by the FACR. FCV = FAV ÷ FACR. If there is a final acute equation rather than a FAV, see also subsection (f).

(10) If the SMCV of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FCV, then that SMCV must be used as the FCV instead of the calculated FCV.

(h) When enough data are available to show that toxicity to two (2) or more species is similarly related to a water quality characteristic, the relationship shall be taken into account as described in this subsection. A final chronic equation can be derived in two (2) ways. The procedure described in subdivision (1) will result in the chronic slope being the same as the acute slope. The procedure described in subdivision (2) will usually result in the chronic slope being different from the acute slope. A chronic criterion based on a water quality characteristic shall be determined as follows:

(1) If ACRs are available for enough species at enough values of the water quality characteristic to indicate that the ACR appears to be the same for all species and appears to be independent of the water quality characteristic, then:

(A) calculate the FACR as the geometric mean of the available SMACRs;

(B) calculate the FCV at the selected value Z of the water quality characteristic by dividing the FAV at Z (see subsection (f)(11)) by the FACR; and

(C) use V = pooled acute slope (see subsection (f)(6)), and L = pooled chronic slope (see subdivision (2)(F)).

(2) When enough data are available to show that chronic toxicity to at least one (1) species is related to a water quality characteristic, the relationship should be taken into account as described in clauses (A) through (E) or using analysis of covariance. The two (2) methods are equivalent and produce identical results. The manual method described in this subdivision provides an understanding of this application of covariance analysis, but computerized versions of covariance analysis are much more convenient for analyzing large data sets. If two (2) or more factors affect toxicity, multiple regression analysis shall be used.

(A) For each species for which comparable chronic toxicity values are available at two (2) or more different values of the water quality characteristic, perform a least squares regression of the chronic toxicity values on the corresponding values of the water quality characteristic to obtain the slope and its ninety-five percent (95%) confidence limits for each species. (Because the best documented relationship is that between hardness and acute toxicity of metals in fresh water and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this section. For relationships based on other water quality characteristics, such as pH, temperature, no transformation, or a different transformation might fit the data better, and appropriate changes will be necessary throughout this section. It is probably preferable, but not necessary, to use the same transformation that was used with the acute values in subsection (f).)

(B) Decide whether the data for each species are relevant, taking into account the range and number of the tested values of the water quality characteristic and the degree of agreement within and between species. For example, a slope based on six (6) data points might be of limited value if it is based only on data for a very narrow range of values of the water quality characteristic. A slope based on only two (2) data points, however, might be more useful if it is consistent with other information and if the two (2) points cover a broad range of the water quality characteristic. In addition, chronic values that appear to be questionable in comparison with other acute and chronic data available for the same species and for other species in the same genus in most cases should not be used. For example, if after adjustment for the water quality characteristic, the chronic values available for a species or genus differ by more than a factor of ten (10), rejection of some or all of the values is, in most cases, absent countervailing circumstances, appropriate. If a useful chronic slope is not available for at least one (1) species or if the available slopes are too dissimilar or if too few data are available to adequately define the relationship between chronic toxicity and the water quality characteristic, it might be appropriate to assume that the chronic slope is the same as the acute slope, which is equivalent to assuming that the ACR is independent of the water quality characteristic. Alternatively, return to subsection (g)(8), using the results of tests conducted under conditions and in waters similar to those commonly used for toxicity tests with the species.

(C) Individually for each species, calculate the geometric mean of the available chronic values and then divide each chronic value for a species by the mean for the species. This normalizes the chronic values so that the geometric mean of the normalized values for each species individually, and for any combination of species, is one (1.0).

(D) Similarly, normalize the values of the water quality characteristic for each species individually.

(E) Individually for each species, perform a least squares regression of the normalized chronic toxicity values on the corresponding normalized values of the water quality characteristic. The resulting slopes and the ninety-five percent (95%) confidence limits will be identical to those obtained in this subdivision. Now, however, if the data are actually plotted, the line of best fit for each individual species will go through the point 1,1 in the center of the graph.

(F) Treat all of the normalized data as if they were all the same species, and perform a least squares regression of all of the normalized chronic values on the corresponding normalized values of the water quality characteristic to obtain the pooled chronic slope, L, and its ninety-five percent (95%) confidence limits. If all normalized data are actually plotted, the line of best fit will go through the point 1,1 in the center of the graph.

(G) For each species, calculate the geometric mean, M, of the toxicity values and the geometric mean, P, of the values of the water quality characteristic. (These are calculated in clauses (C) and (D).)

(H) For each species, calculate the logarithm, Q, of the SMCV at a selected value, Z, of the water quality characteristic using the equation:

$$Q = \ln M - L(\ln P - \ln Z)$$

(Although it is not necessary, it is recommended that the same value of the water quality characteristic be used here as was used in subsection (f).)

(I) For each species, calculate a SMCV at Z using the equation:

$$SMCV = e^{Q}$$

(Alternatively, the SMCV at Z can be obtained by skipping clause (G), using the equations in clause (H) and this clause to adjust each chronic value individually to Z, and then calculating the geometric means of the adjusted values for each species individually. This alternative procedure allows an examination of the range of the adjusted chronic values for each species.)

(J) Obtain the FCV at Z by using the procedure described in subsection (e)(10) through (e)(15).

(3) If the SMCV at Z of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FCV at Z, then that SMCV shall be used as the FCV at Z instead of the calculated FCV.

(4) The final chronic equation is written as:

$$FCV = e^{(L[\ln(\text{water quality characteristic})] + \ln S - L[\ln Z])}$$

Where: L = pooled chronic slope.

S = FCV at Z.

Because L, S, and Z are known, the FCV can be calculated for any selected value of the water quality characteristic.

(i) A final plant value (FPV) is the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test material were measured and the adverse effect was biologically important. Appropriate measures of the toxicity of the material to aquatic plants are used to compare the relative sensitivities of aquatic plants and animals. Although procedures for conducting and interpreting the results of toxicity tests with plants are not well-developed, results of tests with plants usually indicate that criteria which adequately protect aquatic animals and their uses will, in most cases, also protect aquatic plants and their uses. When developing an FPV, the following apply:

(1) A plant value is the result of a ninety-six (96) hour test conducted with an alga or a chronic test conducted with an aquatic vascular plant. (A test of the toxicity of a metal to a plant shall not be used if the medium contained an excessive amount of a complexing agent, such as EDTA, that might affect the toxicity of the metal. Concentrations of EDTA above two hundred (200) µg/L should be considered excessive.)

(2) The FPV shall be obtained by selecting the lowest result from a test with an important aquatic plant species in which the concentrations of test material are measured and the endpoint is biologically important.

(j) Pertinent information that could not be used in earlier subsections may be available concerning adverse effects on aquatic organisms. The following are data that may affect a criterion if the data were obtained with an important species, the test concentrations were measured, and the endpoint was biologically important:

(1) Cumulative and delayed toxicity, reduction in survival, growth, or reproduction, or any other adverse effect that has been shown to be biologically important. Delayed toxicity is an adverse effect to an organism that results from, and occurs after the end of, its exposure to one (1) or more test materials.

(2) Species for which no other data are available.

(3) Behavioral, biochemical, physiological, microcosm, and field studies.

(4) Tests conducted in unusual dilution water (see subsections (e)(4) and (g)(4)).

(5) Chronic tests in which the concentrations were not measured (see subsection (g)(2)).

(6) Tests with previously exposed organisms (see subsection (c)(6)(C)).

(7) Tests on formulated mixtures or emulsifiable concentrates (see subsection (c)(4)).

(k) A criterion consists of two (2) concentrations, the criterion maximum concentration (CMC) and the criterion continuous concentration (CCC), determined as follows:

(1) The CMC is equal to one-half (½) the FAV. The CMC is an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

(2) The CCC is equal to the lowest of the FCV or the FPV (if available) unless other data (see subsection (j)) show that a lower value should be used. The CCC is an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. If toxicity is related to a water quality characteristic, the CCC is obtained from the final chronic equation or FPV (if available) that results in the lowest concentrations in the usual range of the water quality characteristic, unless other data (see subsection (j)) show that a lower value should be used.

(3) Round both the CMC and the CCC to two (2) significant digits.

(4) The criterion is stated as follows:

(A) The procedures described in the Tier I methodology indicate that, except possibly where a commercially or recreationally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four (4) day average concentration of (insert name of substance) does not exceed (insert the CCC for the substance) µg/L more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed (insert the CMC for the substance) µg/L more than once every three (3) years on the average.

(B) If the CMC averaging period of one (1) hour or the CCC averaging period of four (4) days is inappropriate for the pollutant, or if the once-in-three-year allowable excursion frequency is inappropriate for the pollutant or for the sites to which a criterion is applied, then the commissioner may specify alternative averaging periods or frequencies. The choice of an alternative averaging period or frequency shall be justified by a scientifically defensible analysis demonstrating that the alternative values will protect the aquatic life uses of the water. Appropriate laboratory data or well-designed field biological surveys shall be submitted to the U.S. EPA as justification for differing averaging periods or frequencies of exceedance.

*(Water Pollution Control Board; 327 IAC 2-1.5-11; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1381; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377)*

327 IAC 2-1.5-12 Determination of Tier II aquatic life values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 12. (a) If all eight (8) minimum data requirements for calculating an FAV using Tier I under section 11 of this rule are not met, a secondary acute value (SAV) for the waters of the Great Lakes system shall be calculated for a chemical as follows:

(1) To calculate a SAV, the lowest GMAV in the database is divided by the secondary acute factor (SAF) (Table 12-1 in this section) corresponding to the number of satisfied minimum data requirements listed in the Tier I methodology (section 11(d)(2)(A) of this rule). (Requirements for definitions, data collection, and data review, contained in section 11(b), 11(c), and 11(e) of this rule, shall be applied to calculation of a SAV.) If all eight (8) minimum data requirements are satisfied, a Tier I criterion calculation may be possible. In order to calculate a SAV, the database must contain, at a minimum, a genus mean acute value (GMAV) for one (1) of the following three (3) genera in the family Daphnidae:

(A) Ceriodaphnia sp.

(B) Daphnia sp.

(C) Simocephalus sp.

(2) If appropriate, the SAV shall be made a function of a water quality characteristic in a manner similar to that described in the Tier I calculation procedure under section 11(f) of this rule.

(b) If three (3) or more experimentally determined ACRs, meeting the data collection and review requirements of section 11(g) of this rule, are available for the chemical, determine the FACR using the procedure described in section 11(g) of this rule. If fewer than three (3) acceptable experimentally determined ACRs are available, use enough assumed ACRs of eighteen (18) so that the total number of ACRs equals three (3). Calculate the secondary acute-chronic ratio (SACR) as the geometric mean of the three (3) ACRs. Thus, if no experimentally determined ACRs are available, the SACR is eighteen (18).

(c) Calculate the secondary chronic value (SCV) using one (1) of the following (if appropriate, the SCV will be made a function of a water quality characteristic in a manner similar to that described in the Tier I calculation procedure under section 11 of this rule):

(1)
func{SCV ~ = ~ FAV over SACR} (use FAV from Tier I)
(2)
func{SCV ~ = ~ SAV over FACR}
(3)
func{SCV ~ = ~ SAV over SACR}

(d) If for a commercially or recreationally important species of the Great Lakes system the geometric mean of the acute values or chronic values from flow-through tests in which the concentrations of the test materials were measured is lower than the calculated SAV or SCV, then that geometric mean must be used as the SAV or SCV instead of the calculated SAV or SCV.

(e) A Tier II value shall consist of two (2) concentrations; the secondary maximum concentration (SMC) and the secondary continuous concentration (SCC) determined as follows:

(1) The SMC is equal to one-half (½) of the SAV.

(2) The SCC is equal to the lowest of the SCV or the final plant value, if available, unless other data (see section 11(j) of this rule) show that a lower value should be used. If toxicity is related to a water quality characteristic, the SCC is obtained from the secondary chronic equation or FPV, if available, that results in the lowest concentrations in the usual range of the water quality characteristic, unless other data (see section 11(j) of this rule) show that a lower value should be used.

(3) Round both the SMC and the SCC to two (2) significant digits.

(4) The Tier II value is stated as follows:

(A) The procedures described in the Tier II methodology indicate that, except possibly where a locally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four (4) day average concentration of (insert name of material) does not exceed (insert the SCC) µg/L more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed (insert the SMC) µg/L more than once every three (3) years on the average.

(B) As provided under section 11(k)(4)(B) of this rule, the commissioner has the discretion to specify alternative averaging periods or frequencies.

(f) On the basis of all available pertinent laboratory and field information, determine if the Tier II value is consistent with sound scientific evidence. If it is not, another value, either higher or lower, shall be derived consistent with the procedures in this section.

(g) The following table shall be used to determine secondary acute factors (SAFs):

Table 12-1

Secondary Acute Factors

| Number of Minimum Data Requirements Satisfied | Adjustment Factor |
|---|---|
| 1 | 21.9 |
| 2 | 13.0 |
| 3 | 8.0 |
| 4 | 7.0 |
| 5 | 6.1 |
| 6 | 5.2 |
| 7 | 4.3 |

*(Water Pollution Control Board; 327 IAC 2-1.5-12; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1391)*

327 IAC 2-1.5-13 Determination of bioaccumulation factors (BAFs)

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 13. (a) This section describes procedures for deriving bioaccumulation factors (BAFs) to be used in the calculation of human health Tier I criteria and Tier II values and wildlife Tier I criteria. A subset of the human health BAFs is also used to identify the chemicals that are considered bioaccumulative chemicals of concern (BCCs). BAFs are derived as follows:

(1) Bioaccumulation reflects uptake of a substance by aquatic organisms exposed to the substance through all routes, such as ambient water and food, as would occur in nature. Bioconcentration reflects uptake of a substance by aquatic organisms exposed to the substance only through the ambient water. Both BAFs and bioconcentration factors (BCFs) are proportionality constants that describe the relationship between the concentration of a substance in aquatic organisms and its concentration in the ambient water. In this section, BAFs, rather than BCFs, are used to calculate Tier I criteria for human health and wildlife and Tier II values for human health because they better account for the total exposure of aquatic organisms to chemicals.

(2) For organic chemicals, the lipid content of the aquatic organisms is used to account for partitioning of organic chemicals within organisms so that data from different tissues and species can be integrated. The baseline BAF is based on the concentration of freely dissolved organic chemicals in the ambient water to facilitate extrapolation from one (1) water to another. Baseline BAFs shall be derived using one (1) of the following four (4) methods:

(A) Measured baseline BAFs are derived from field-measured BAFs.

(B) Predicted baseline BAFs are derived using biota-sediment accumulation factors (BSAFs).

(C) Predicted baseline BAFs are derived by multiplying a laboratory-measured BCF by a food-chain multiplier (FCM).

(D) Predicted baseline BAFs are derived by multiplying a predicted BCF by a FCM.

(3) For inorganic chemicals, BAFs are assumed to equal BCFs (that is, the FCM is one (1.0)) unless chemical-specific biomagnification data support using a FCM other than one (1.0). The baseline BAFs are derived using either of the following two (2) methods:

(A) Field-measured BAFs.

(B) By multiplying laboratory-measured BCFs by a FCM.

(4) Because both humans and wildlife consume fish from both trophic levels three (3) and four (4), two (2) baseline BAFs are needed to calculate either a human health criterion or value or a wildlife criterion for a chemical. When appropriate, ingestion through consumption of invertebrates, plants, mammals, and birds in the diet of wildlife species to be protected may be taken into account.

(b) The following procedures shall be used to review and select the data necessary to determine BAFs, BSAFs, and BCFs:

(1) Measured BAFs, BSAFs, and BCFs are assembled from available sources, including the following:

(A) U.S. EPA Ambient Water Quality Criteria documents issued after January 1, 1980.

(B) Published scientific literature.

(C) Reports issued by U.S. EPA or other reliable sources.

(D) Unpublished data.

(E) Sources referenced in the Aquatic Toxicity Information Retrieval (AQUIRE) database.

(2) The following procedural and quality assurance requirements shall be met for field-measured BAFs:

(A) The field studies used shall be limited to those conducted in the Great Lakes system with fish at or near the top of the aquatic food chain, for example, in trophic levels three (3) or four (4).

(B) The trophic level of the fish species shall be determined.

(C) The site of the field study should not be so unique that the BAF cannot be extrapolated to other locations where the criteria and values will apply.

(D) For organic chemicals, the percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.

(E) The concentration of the chemical in the water shall be measured in a way that can be related to particulate organic carbon (POC) or dissolved organic carbon (DOC) and should be relatively constant during the steady-state time period.

(F) For organic chemicals with log $K_{OW}$ greater than four (4), the concentrations of POC and DOC in the ambient water shall be either measured or reliably estimated.

(G) For inorganic and organic chemicals, BAFs shall be used only if they are expressed on a wet weight basis; BAFs reported on a dry weight basis cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.

(3) The following procedural and quality assurance requirements shall be met for field-measured BSAFs:

(A) The field studies used shall be limited to those conducted in the Great Lakes system with fish at or near the top of the aquatic food chain, for example, in trophic levels three (3) or four (4).

(B) Samples of surface sediments (zero (0) to one (1) centimeter is ideal) shall be from locations in which

there is net deposition of fine sediment and is representative of average surface sediment in the vicinity of the organism.

(C) The $K_{OW}$s used shall be of acceptable quality as described in subdivision (6).

(D) The site of the field study should not be so unique that the resulting BAF cannot be extrapolated to other locations where the criteria and values will apply.

(E) The trophic level of the fish species shall be determined.

(F) The percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.

(4) The following procedural and quality assurance requirements shall be met for laboratory-measured BCFs:

(A) The test organism shall not be diseased, unhealthy, or adversely affected by the concentration of the chemical.

(B) The total concentration of the chemical in the water shall be measured and should be relatively constant during the steady-state time period.

(C) The organisms shall be exposed to the chemical using a flow-through or renewal procedure.

(D) For organic chemicals, the percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BCF.

(E) For organic chemicals with log $K_{OW}$ greater than four (4), the concentrations of POC and DOC in the test solution shall be either measured or reliably estimated.

(F) Laboratory-measured BCFs should be determined using fish species, but BCFs determined with molluscs and other invertebrates may be used with caution. For example, because invertebrates metabolize some chemicals less efficiently than vertebrates, a baseline BCF determined for such a chemical using invertebrates is expected to be higher than a comparable baseline BCF determined using fish.

(G) If laboratory-measured BCFs increase or decrease as the concentration of the chemical increases in the test solutions in a bioconcentration test, the BCF measured at the lowest test concentration that is above concentrations existing in the control water shall be used, for example, a BCF should not be calculated from a control treatment. The concentrations of an inorganic chemical in a bioconcentration test should be greater than normal background levels and greater than levels required for normal nutrition of the test species if the chemical is a micronutrient, but below levels that adversely affect the species. Bioaccumulation of an inorganic chemical might be overestimated if concentrations are at or below normal background levels due to, for example, nutritional requirements of the test organisms.

(H) For inorganic and organic chemicals, BCFs shall be used only if they are expressed on a wet weight basis. BCFs reported on a dry weight basis cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.

(I) BCFs for organic chemicals may be based on measurement of radioactivity only when the BCF is intended to include metabolites or when there is confidence that there is no interference due to metabolites.

(J) The calculation of the BCF must appropriately address growth dilution.

(K) Other aspects of the methodology used shall be similar to those described by ASTM, 1990, Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs, Standard E 1022.

(5) The following procedural and quality assurance requirements shall be met for predicted BCFs:

(A) The $K_{OW}$ used shall be of acceptable quality as described in subdivision (6).

(B) The predicted baseline BCF shall be calculated using the equation:

$$\text{predicted baseline BCF} = K_{OW}$$

Where: $K_{OW}$ = octanol-water partition coefficient.

(6) The value of $K_{OW}$ shall be determined as follows:

(A) The value of $K_{OW}$ used for an organic chemical shall be determined by giving priority to the experimental and computational techniques used as follows:

(i) Where the Log $K_{OW}$ is less than four (4) (Log $K_{OW} < 4$):

| Priority | Technique |
|---|---|
| 1 | Slow-stir |
| 1 | Generator-column |
| 1 | Shake-flask |

| | |
|---|---|
| 2 | Reverse-phase liquid chromatography on C18 chromatography packing with extrapolation to zero percent solvent |
| 3 | Reverse-phase liquid chromatography on C18 chromatography packing without extrapolation to zero percent solvent |
| 4 | Calculated by the CLOGP program |

(ii) Where the Log $K_{OW}$ is greater than four (4) (Log $K_{OW}$ > 4):

| Priority | Technique |
|---|---|
| 1 | Slow-stir |
| 1 | Generator-column |
| 2 | Reverse-phase liquid chromatography on C18 chromatography packing with extrapolation to zero percent solvent |
| 3 | Reverse-phase liquid chromatography on C18 chromatography packing without extrapolation to zero percent solvent |
| 4 | Shake-flask |
| 5 | Calculated by the CLOGP program |

(B) The CLOGP program is a computer program available from Pomona College. A value of $K_{OW}$ that seems to be different from the others should be considered an outlier and not used. The value of $K_{OW}$ used for an organic chemical shall be the geometric mean of the available $K_{OW}$s with highest priority or can be calculated from the arithmetic mean of the available log $K_{OW}$s with the highest priority. Because it is an intermediate value in the derivation of a BAF, the value used for the $K_{OW}$ of a chemical should not be rounded to fewer than three (3) significant digits and a value for log $K_{OW}$ should not be rounded to fewer than three (3) significant digits after the decimal point.

(7) This section provides overall guidance for the derivation of BAFs, but it cannot cover all the decisions that must be made in the review and selection of acceptable data. Professional judgment is required throughout the process. A degree of uncertainty is associated with the determination of any BAF, BSAF, BCF, or $K_{OW}$. The amount of uncertainty in a baseline BAF depends on both the quality of data available and the method used to derive the BAF.

(8) Hereinafter in this section, "BAF", "BSAF", "BCF", and "$K_{OW}$" refer to the "BAF", "BSAF", "BCF", and "$K_{OW}$" that are consistent with the procedural and quality assurance requirements given in this subsection.

(c) For comparative purposes, baseline BAFs should be derived for each chemical by as many of the four (4) methods as available data allow. Baseline BAFs shall be derived using the following four (4) methods, which are listed from most preferred to least preferred:

(1) A measured baseline BAF for an organic or inorganic chemical derived from a field study of acceptable quality.

(2) A predicted baseline BAF for an organic chemical derived using field-measured BSAFs of acceptable quality.

(3) A predicted baseline BAF for an organic or inorganic chemical derived from a BCF measured in a laboratory study of acceptable quality and an FCM.

(4) A predicted baseline BAF for an organic chemical derived from a $K_{OW}$ of acceptable quality and an FCM.

(d) The following procedures shall be used to calculate baseline BAFs for organic chemicals:

(1) The following procedures shall be used to determine the lipid-normalized concentration:

(A) It is assumed that BAFs and BCFs for organic chemicals can be extrapolated on the basis of percent lipid from one (1) tissue to another and from one (1) aquatic species to another in most cases.

(B) Because BAFs and BCFs for organic chemicals are related to the percent lipid, it does not make any difference whether the tissue sample is whole body or edible portion, but both the BAF (or BCF) and the percent lipid must be determined for the same tissue. The percent lipid of the tissue should be measured during the BAF or BCF study, but in some cases it can be reliably estimated from measurements on tissue from other organisms. If percent lipid is not reported for the test organisms in the original study, it may be obtained from the author; or, in the case of a laboratory study, lipid data for the same or a comparable laboratory population of test organisms that were used in the original study may be used.

(C) The lipid-normalized concentration, $C_{\ddot{o}}$, of a chemical in tissue is defined using the following equation:

func { C sub ✡ ~'~ {C sub B} over {f sub ✡} }

Where:

$C_B$ = concentration of the organic chemical in the tissue of aquatic biota (either whole organism or specified tissue) (micrograms per gram).

$f_{\ddot{o}}$ = fraction of the tissue that is lipid.

(2) By definition, baseline BAFs and BCFs for organic chemicals, whether measured or predicted are based on the concentration of the chemical that is freely dissolved in the ambient water in order to account for bioavailability. The following procedures shall be used to determine this freely dissolved concentration:

(A) For the purposes of this subsection, the relationship between the total concentration of the chemical in the water (that which is freely dissolved plus that which is sorbed to particulate organic carbon or to dissolved organic carbon) to the freely dissolved concentration of the chemical in the ambient water shall be calculated using the following equation:

func { C SUB w SUP fd ~'~ (`f sub fd`)`(`C sub w sup t`) }

Where:

$C^d$ = freely dissolved concentration of the organic chemical in the ambient water.

C = total concentration of the organic chemical in the ambient water.

$f_{fd}$ = fraction of the total chemical in the ambient water that is freely dissolved.

(B) The fraction of the total chemical in the ambient water that is freely dissolved, $f_{fd}$, shall be calculated using the following equation:

func {{ f sub fd ~'~ {1} over {1~%~{(`DOC`)`(`K sub OW`)} over {10}~%~ `(`POC`)`(`K sub OW`) } }}

Where:

DOC = concentration of dissolved organic carbon in kilograms of dissolved organic carbon per liter of water.

$K_{OW}$ = octanol-water partition coefficient of the chemical.

POC = concentration of particulate organic carbon in kilograms of particulate organic carbon per liter of water.

(3) In the absence of a field-measured BAF or a predicted BAF derived from a BSAF, a food chain multiplier (FCM) shall be used to calculate the baseline BAF for trophic levels three (3) and four (4) from a laboratory-measured or predicted BCF. For an organic chemical, the FCM used shall be derived from Table 13-1 in subsection (h), using the chemical's log $K_{OW}$ and linear interpolation. An FCM greater than one (1.0) applies to most organic chemicals with a log $K_{OW}$ of four (4) or more. The trophic level used shall take into account the age or size of the fish species consumed by the human, avian, or mammalian predator because, for some species of fish, the young are in trophic level three (3) whereas the adults are in trophic level four (4).

(4) A baseline BAF shall be calculated from a field-measured BAF of acceptable quality using the following equation:

func {Baseline~BAF~=~ left [~{Measured~BAF sub T sup t} OVER {f SUB{fd}} ~-~ 1~ right ]~ { left ( ~1 over {f sub ✡} ~ right ) }}

Where:

BAF = BAF based on total concentration in tissue and water.

$f_{\ddot{o}}$ = fraction of the tissue that is lipid.

$f_{fd}$ = fraction of the total chemical that is freely dissolved in the ambient water.

The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the field-measured BAF. For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured baseline BAF is available for a given species. For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be calculated. If a baseline BAF based on a measured BAF is available for either trophic level three (3) or four (4), but not both, a measured baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from Table 13-1 in subsection (h) for the chemical.

(5) A baseline BAF shall be calculated from a field-measured BAF in accordance with the following:

(A) A baseline BAF for organic chemical "i" shall be calculated from a field-measured BSAF of acceptable quality using the following equation:

func { (`Baseline~BAF`) sub i ~=~ (`Baseline~ BAF`) sub r ~cdot~ {(`BSAF`) sub i ~cdot~ (`K sub OW`) sub i } over

{(`BSAF`) sub r ~cdot~ (`K sub OW `) sub r } }

Where: $(BSAF)_i$ = BSAF for chemical "i".

$(BSAF)_r$ = BSAF for the reference chemical "r".

$(K_{OW})_i$ = octanol-water partition coefficient for chemical "i".

$(K_{OW})_r$ = octanol-water partition coefficient for the reference chemical "r".

(B) A BSAF shall be calculated using the following equation:

func { BSAF ~=~ {C sub ☼ } over {C sub SOC} }

Where: $C_{☼}$ = the lipid-normalized concentration of the chemical in tissue.

$C_{SOC}$ = the organic carbon-normalized concentration of the chemical in sediment.

(C) The organic carbon-normalized concentration of a chemical in sediment, $C_{SOC}$, shall be calculated using the following equation:

func {C sub SOC ~=~ {C sub S} over {f sub OC} }

Where: $C_S$ = concentration of chemical in sediment (micrograms per gram of sediment).

$f_{OC}$ = fraction of the sediment that is organic carbon.

(D) Predicting BAFs from BSAFs requires data from a steady-state (or near steady-state) condition between sediment and ambient water for both a reference chemical "r" with a field-measured $BAF^d$ and other chemicals "n = i" for which BSAFs are to be determined.

(E) The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the BSAF. For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one (1) baseline BAF is predicted from BSAFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs derived using BSAFs shall be calculated.

(F) If a baseline BAF based on a measured BSAF is available for either trophic level three (3) or four (4), but not both, a baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from Table 13-1 in subsection (h) for the chemical.

(6) A baseline BAF for trophic level three (3) and a baseline BAF for trophic level four (4) shall be calculated from a laboratory-measured BCF of acceptable quality and a FCM using the following equation:

func {{{Baseline~BAF~=~ (`FCM`)` left[{Measured~BCF sub T sup t} OVER {f SUB{fd}} ~-~ 1~ right ]~ { left (1 over {f sub ☼}~ right ) }}}}

Where: BCF = BCF based on total concentration in tissue and water.

$f_{☼}$ = fraction of the tissue that is lipid.

$f_{fd}$ = fraction of the total chemical in the test water that is freely dissolved.

FCM = the food-chain multiplier obtained from Table 13-1 in subsection (h) by linear interpolation for trophic level three (3) or four (4) as necessary.

For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one (1) baseline BAF is predicted from laboratory-measured BCFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs based on laboratory-measured BCFs shall be calculated.

(7) A baseline BAF for trophic level three (3) and a baseline BAF for trophic level four (4) shall be calculated from a $K_{OW}$ of acceptable quality and a FCM using the following equation:

func {{Baseline}}~ func {{BAF` =~(`FCM`)`(`predicted`baseline`BCF`)~=~ (`FCM`)`(`K sub OW`) }}

Where: FCM = the food-chain multiplier obtained from Table 13-1 in subsection (h) by linear interpolation for trophic level three (3) or four (4) as necessary.

$K_{OW}$ = octanol-water partition coefficient.

(e) The following procedures shall be used to calculate human health and wildlife BAFs for organic chemicals:

(1) To calculate human health and wildlife BAFs for an organic chemical, the $K_{OW}$ of the chemical shall be used with a

POC concentration of 0.00000004 kilograms per liter and a DOC concentration of 0.000002 kilograms per liter to yield the fraction freely dissolved:

func { f sub {fd}~=~ {1} over {1~+~ {(`DOC`)`(K sub OW`)} over {10} ~+~ (`POC`)`(`K sub OW `)} }

func {=~{1} over {1~+~ {(`0.000002~kg/L`)`(`K sub OW `)} over {10} ~+~(`0.00000004~kg/L`)`(`K sub OW `)} }

func {{ =~ {1} over {1~+~ (`0.00000024~kg/L`)`(`K sub OW `)} }}

(2) The human health BAFs for an organic chemical shall be calculated using the following equations:

(A) For trophic level three (3):

Human Health

func {BAF sub TL3 sup HH} = [(baseline BAF)(0.0182)+ 1]($f_{fd}$)

Where: 0.0182 is the standardized fraction lipid values for trophic level three (3) that is used to derive human health criteria and values.

(B) For trophic level four (4):

Human Health

func {BAF sub TL4 sup HH}= [(baseline BAF)(0.0310)+ 1]($f_{fd}$)

Where: 0.0310 is the standardized fraction lipid values for trophic level four (4) that is used to derive human health criteria and values.

(3) The wildlife BAFs for an organic chemical shall be calculated using the following equations:

(A) For trophic level three (3):

Wildlife

func {BAF sub TL3 sup WL}= [(baseline BAF)(0.0646)+ 1]($f_{fd}$)

Where: 0.0646 is the standardized fraction lipid value for trophic level three (3) that is used to derive wildlife criteria.

(B) For trophic level four (4):

Wildlife

func {BAF sub TL4 sup WL}= [(baseline BAF)(0.1031)+ 1]($f_{fd}$)

Where: 0.1031 is the standardized fraction lipid values for trophic level four (4) that is used to derive wildlife criteria.

(f) The following procedures shall be used to calculate human health and wildlife BAFs for inorganic chemicals:

(1) For inorganic chemicals, the baseline BAFs for trophic levels three (3) and four (4) are both assumed to equal the BCF determined for the chemical with fish, for example, the FCM is assumed to be one (1) for both trophic levels three (3) and four (4). However, an FCM greater than one (1) might be applicable to some metals, such as mercury, if, for example, an organometallic form of the metal biomagnifies.

(2) The following procedures shall be used to calculate human health BAFs for inorganic chemicals:

(A) Measured BAFs and BCFs used to determine human health BAFs for inorganic chemicals shall be based on edible tissue, such as muscle, of freshwater fish unless it is demonstrated that whole body BAFs or BCFs are similar to edible tissue BAFs or BCFs. BCFs and BAFs based on measurements of aquatic plants and invertebrates should not be used in the derivation of human health criteria and values.

(B) If one (1) or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with the muscle of fish:

(i) for each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured BAF is available for a given species; and

(ii) for each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the human health BAF for that chemical.

(C) If an acceptable measured baseline BAF is not available for an inorganic chemical and one (1) or more acceptable edible portion laboratory measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be one (1.0) unless chemical-specific biomagnification data support using a multiplier other than one (1.0). The predicted baseline BAF shall be used as the human health BAF for that chemical.

(3) The following procedures shall be used to calculate wildlife BAFs for inorganic chemicals:

(A) Measured BAFs and BCFs used to determine wildlife BAFs for inorganic chemicals shall be based on whole body freshwater fish and invertebrate data unless it is demonstrated that edible tissue BAFs or BCFs are similar to whole body BAFs or BCFs.

(B) If one (1) or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with whole body of fish or invertebrates:

(i) for each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured BAF is available for a given species; and

(ii) for each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the wildlife BAF for that chemical.

(C) If an acceptable measured baseline BAF is not available for an inorganic chemical and one (1) or more acceptable whole body laboratory measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be one (1.0) unless chemical-specific biomagnification data support using a multiplier other than one (1.0). The predicted baseline BAF shall be used as the wildlife BAF for that chemical.

(g) For both organic and inorganic chemicals, human health and wildlife BAFs for both trophic levels shall be reviewed for consistency with all available data concerning the bioaccumulation, bioconcentration, and metabolism of the chemical. For example, information concerning octanol-water partitioning, molecular size, or other physicochemical properties that might enhance or inhibit bioaccumulation should be considered for organic chemicals. BAFs derived in accordance with this methodology should be modified if changes are justified by available data.

(h) The following shall be used to obtain food chain multipliers:

Table 13-1

Food-Chain Multipliers for Trophic Levels 2, 3, and 4

| Log $K_{OW}$ | T. L. 2 | T. L. 3[a] | T. L. 4 |
|---|---|---|---|
| 2.0 | 1.000 | 1.005 | 1.000 |
| 2.5 | 1.000 | 1.010 | 1.002 |
| 3.0 | 1.000 | 1.028 | 1.007 |
| 3.1 | 1.000 | 1.034 | 1.007 |
| 3.2 | 1.000 | 1.042 | 1.009 |
| 3.3 | 1.000 | 1.053 | 1.012 |
| 3.4 | 1.000 | 1.067 | 1.014 |
| 3.5 | 1.000 | 1.083 | 1.019 |
| 3.6 | 1.000 | 1.103 | 1.023 |
| 3.7 | 1.000 | 1.128 | 1.033 |
| 3.8 | 1.000 | 1.161 | 1.042 |
| 3.9 | 1.000 | 1.202 | 1.054 |
| 4.0 | 1.000 | 1.253 | 1.072 |
| 4.1 | 1.000 | 1.315 | 1.096 |
| 4.2 | 1.000 | 1.380 | 1.13 |
| 4.3 | 1.000 | 1.491 | 1.178 |
| 4.4 | 1.000 | 1.614 | 1.242 |
| 4.5 | 1.000 | 1.766 | 1.334 |
| 4.6 | 1.000 | 1.950 | 1.459 |

| | | | |
|---|---|---|---|
| 4.7 | 1.000 | 2.175 | 1.633 |
| 4.8 | 1.000 | 2.452 | 1.871 |
| 4.9 | 1.000 | 2.780 | 2.193 |
| 5.0 | 1.000 | 3.181 | 2.612 |
| 5.1 | 1.000 | 3.643 | 3.162 |
| 5.2 | 1.000 | 4.188 | 3.873 |
| 5.3 | 1.000 | 4.803 | 4.742 |
| 5.4 | 1.000 | 5.502 | 5.821 |
| 5.5 | 1.000 | 6.266 | 7.079 |
| 5.6 | 1.000 | 7.096 | 8.551 |
| 5.7 | 1.000 | 7.962 | 10.209 |
| 5.8 | 1.000 | 8.841 | 12.050 |
| 5.9 | 1.000 | 9.716 | 13.964 |
| 6.0 | 1.000 | 10.556 | 15.996 |
| 6.1 | 1.000 | 11.337 | 17.783 |
| 6.2 | 1.000 | 12.064 | 19.907 |
| 6.3 | 1.000 | 12.691 | 21.677 |
| 6.4 | 1.000 | 13.228 | 23.281 |
| 6.5 | 1.000 | 13.662 | 24.604 |
| 6.6 | 1.000 | 13.980 | 25.645 |
| 6.7 | 1.000 | 14.223 | 26.363 |
| 6.8 | 1.000 | 14.355 | 26.669 |
| 6.9 | 1.000 | 14.388 | 26.669 |
| 7.0 | 1.000 | 14.305 | 26.242 |
| 7.1 | 1.000 | 14.142 | 25.468 |
| 7.2 | 1.000 | 13.852 | 24.322 |
| 7.3 | 1.000 | 13.474 | 22.856 |
| 7.4 | 1.000 | 12.987 | 21.038 |
| 7.5 | 1.000 | 12.517 | 18.967 |
| 7.6 | 1.000 | 11.708 | 16.749 |
| 7.7 | 1.000 | 10.914 | 14.388 |
| 7.8 | 1.000 | 10.069 | 12.050 |

| | | | |
|---|---|---|---|
| 7.9 | 1.000 | 9.162 | 9.840 |
| 8.0 | 1.000 | 8.222 | 7.798 |
| 8.1 | 1.000 | 7.278 | 6.012 |
| 8.2 | 1.000 | 6.361 | 4.519 |
| 8.3 | 1.000 | 5.489 | 3.311 |
| 8.4 | 1.000 | 4.683 | 2.371 |
| 8.5 | 1.000 | 3.949 | 1.663 |
| 8.6 | 1.000 | 3.296 | 1.146 |
| 8.7 | 1.000 | 2.732 | 0.778 |
| 8.8 | 1.000 | 2.246 | 0.521 |
| 8.9 | 1.000 | 1.837 | 0.345 |
| 9.0 | 1.000 | 1.493 | 0.226 |

[a]The FCMs for trophic level 3 are the geometric mean of the FCMs for sculpin and alewife.

*(Water Pollution Control Board; 327 IAC 2-1.5-13; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1392; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377)*

327 IAC 2-1.5-14 Determination of human health criteria and values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 14. (a) This subsection establishes a procedure required when developing Tier I criteria and Tier II values for the protection of human health as follows:

(1) The goal of the human health criteria for the Great Lakes system is the protection of humans from unacceptable exposure to toxicants via consumption of contaminated fish and drinking water and from ingesting water as a result of participation in water-oriented recreational activities.

(2) The criteria developed shall provide a level of protection likely to be without appreciable risk of carcinogenic or noncarcinogenic effects. Criteria are a function of the level of designated risk or no adverse effect estimation, selection of data, and exposure assumptions. Ambient criteria for single carcinogens shall not be set at a level representing a lifetime upper-bound incremental risk greater than one (1) in one hundred thousand (100,000) of developing cancer using the hazard assessment techniques and exposure assumptions described in this subsection. Criteria affording protection from noncarcinogenic effects shall be established at levels that, taking into account uncertainties, are considered likely to be without an appreciable risk of adverse human health effects (such as acute, subchronic, and chronic toxicity, including reproductive and developmental effects) during a lifetime of exposure, using the risk assessment techniques and exposure assumptions described in this subsection.

(3) Chemical concentration levels in surface water protective of human health shall be derived based on either a Tier I or Tier II classification. The two (2) Tiers are primarily distinguished by the amount of toxicity data available for deriving the concentration levels and the quantity and quality of data on bioaccumulation.

(b) The best available toxicity data on the adverse health effects of a chemical and the best data on bioaccumulation factors shall be used when developing human health Tier I criteria or Tier II values. The best available toxicity data shall include data from well-conducted epidemiologic or animal studies that provide, in the case of carcinogens, an adequate weight of evidence of potential human carcinogenicity and, in the case of noncarcinogens, a dose-response relationship involving critical effects biologically relevant to humans. Such information can be obtained from the U.S. EPA Integrated Risk Information System (IRIS) database, the scientific literature, and other informational databases, studies, or reports containing adverse health effects data of adequate quality for use in this procedure. Strong consideration shall be given to the most currently available guidance provided by IRIS in deriving criteria or values, supplemented with any recent data not incorporated into IRIS. When deviations from IRIS are anticipated or considered necessary, such actions shall be communicated to the U.S. EPA Reference

Dose (RfD) or the Cancer Risk Assessment Verification Endeavor (CRAVE) workgroup. The best available bioaccumulation data shall include data from field studies and well-conducted laboratory studies.

(1) Tier I criteria and Tier II values shall be derived using the methodologies described in subsection (c)(1) when there is adequate evidence of potential human carcinogenic effects for a chemical. The U.S. EPA classification system for chemical carcinogens, which is described in the 1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1986) shall be used in determining whether adequate evidence of potential carcinogenic effects exists.

(A) Carcinogens are classified, depending on the weight of evidence, as either human carcinogens, probable human carcinogens, or possible human carcinogens. The human evidence is considered inadequate and therefore the chemical cannot be classified as a human carcinogen if one (1) of the two (2) following conditions exists:

(i) There are few pertinent data.

(ii) The available studies, while showing evidence of association, do not exclude chance, bias, or confounding and therefore a causal interpretation is not credible. The animal evidence is considered inadequate, and therefore the chemical cannot be classified as a probable or possible human carcinogen, when, because of major qualitative or quantitative limitations, the evidence cannot be interpreted as showing either the presence or absence of a carcinogenic effect.

(B) Chemicals are described as human carcinogens when there is sufficient evidence from epidemiological studies to support a causal association between exposure to the chemicals and cancer.

(C) Chemicals described as probable human carcinogens include chemicals for which the weight of evidence of human carcinogenicity based on epidemiological studies is limited. Limited human evidence is that which indicates that a causal interpretation is credible, but that alternative explanations, such as chance, bias, or confounding, cannot adequately be excluded. Probable human carcinogens are also agents for which there is sufficient evidence from animal studies and for which there is inadequate evidence or no data from epidemiologic studies.

(i) Sufficient animal evidence is provided by data that indicate that there is an increased incidence of malignant tumors or combined malignant and benign tumors:

(AA) in multiple species or strains;

(BB) in multiple experiments, for example, with different routes of administration or using different dose levels; or

(CC) to an unusual degree in a single experiment with regard to high incidence, unusual site or type of tumor, or early age at onset.

(ii) Additional evidence may be provided by data on dose-response effects, as well as information from short term tests (such as mutagenicity and genotoxicity tests that help determine whether the chemical interacts directly with DNA) or on chemical structure, metabolism, or mode of action.

(D) Possible human carcinogens are chemicals with limited evidence of carcinogenicity in animals in the absence of human data.

(i) Limited animal evidence is defined as data that suggest a carcinogenic effect but are limited because:

(AA) the studies involve a single species, strain, or experiment and do not meet criteria for sufficient evidence (see clause (C));

(BB) the experiments are restricted by inadequate dosage levels, inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, too few animals, or inadequate reporting; or

(CC) the studies indicate an increase in the incidence of benign tumors only.

(ii) More specifically, this group may include a wide variety of evidence, for example:

(AA) a malignant tumor response in a single, well-conducted experiment that does not meet conditions for sufficient evidence;

(BB) tumor response of marginal statistical significance in studies having inadequate design or reporting;

(CC) benign but not malignant tumors with an agent showing no response in a variety of short term tests for mutagenicity; and

(DD) response of marginal statistical significance in a tissue known to have a high or variable background rate.

(E) Weight of evidence of potential human carcinogenic effects sufficient to derive a Tier I human cancer criterion (HCC) shall generally include human carcinogens, and probable human carcinogens and may include, on a case-by-case basis, possible human carcinogens if studies have been well-conducted albeit based

on limited evidence, when compared to studies used in classifying human and probable human carcinogens. The decision to use data on a possible human carcinogen for deriving Tier I criteria shall be a case-by-case determination. In determining whether to derive a Tier I HCC, additional evidence that shall be considered includes, but is not limited to, the following:

(i) Available information on mode of action, such as mutagenicity and genotoxicity (determinations of whether the chemical interacts directly with DNA).

(ii) Structure activity.

(iii) Metabolism.

(F) Weight of evidence of possible human carcinogenic effects sufficient to derive a Tier II human cancer value shall include those possible human carcinogens for which there are, at a minimum, data sufficient for quantitative risk assessment, but for which data are inadequate for Tier I criterion development due to a tumor response of marginal statistical significance or inability to derive a strong dose-response relationship. As with the use of data on possible human carcinogens in developing Tier I criteria, the decision to use data on possible human carcinogens to derive Tier II values shall be made on a case-by-case basis. In determining whether to derive Tier II human cancer values, additional evidence that shall be considered includes, but is not limited to, the following:

(i) Available information on mode of action such as mutagenicity and genotoxicity (determinations of whether the chemical interacts directly with DNA).

(ii) Structure activity.

(iii) Metabolism.

(2) All available toxicity data shall be evaluated considering the full range of possible health effects of a chemical, for example, acute/subacute, chronic/subchronic, and reproductive/developmental effects, in order to best describe the dose-response relationship of the chemical, and to calculate human noncancer criteria and values that will protect against the most sensitive endpoint of toxicity. Although it is desirable to have an extensive database that considers a wide range of possible adverse effects, this type of data exists for a very limited number of chemicals. For many others, there is a range in quality and quantity of data available. To assure reliability of criteria and values, it is necessary to establish a minimum database with which to develop Tier I criteria or Tier II values. The following represent the minimum data sets necessary for this procedure:

(A) The minimum data set sufficient to derive a Tier I human noncancer criterion (HNC) shall include at least one (1) well-conducted epidemiologic study or animal study. A well-conducted epidemiologic study for a Tier I HNC must quantify the exposure level and demonstrate positive association between exposure to a chemical and an adverse effect in humans. A well-conducted study in animals must demonstrate a dose-response relationship involving one (1) or more critical effects biologically relevant to humans. For example, study results from an animal whose pharmacokinetics and toxicokinetics match those of a human would be considered most biologically relevant. Ideally, the duration of a study should span multiple generations of exposed test species or at least a major portion of the life span of one (1) generation. This type of data is currently very limited. By the use of uncertainty adjustments, shorter term studies such as ninety (90) day subchronic studies with evaluation of more limited effect may be used to extrapolate to longer exposures or to account for a variety of adverse effects. For Tier I criteria developed pursuant to this procedure, such a limited study must be conducted for at least ninety (90) days in rodents or ten percent (10%) of the life span of other appropriate test species and demonstrate a no observable adverse effect level (NOAEL). Chronic studies of one (1) year or longer in rodents or fifty percent (50%) of the life span or greater in other appropriate test species that demonstrate a lowest observable adverse effect level (LOAEL) may be sufficient for use in Tier I criterion derivation if the effects observed at the LOAEL were relatively mild and reversible as compared to effects at higher doses. This does not preclude the use of a LOAEL from a study of chronic duration with only one (1) or two (2) doses if the effects observed appear minimal when compared to effect levels observed at higher doses in other studies.

(B) When the minimum data for deriving Tier I criteria are not available to meet the Tier I data requirements, a more limited database may be considered for deriving Tier II values. As with Tier I criteria, all available data shall be considered and ideally should address a range of adverse health effects with exposure over a substantial portion of the life span, or multiple generations, of the test species. When such data are lacking, it may be necessary to rely on less extensive data in order to establish a Tier II value. With the use of appropriate uncertainty factors to account for a less extensive database, the minimum data sufficient to derive a Tier II value shall include a NOAEL from at least one (1) well-conducted short term repeated dose study. This study shall be of at least twenty-eight (28) days duration, in animals demonstrating a dose-response, and involving effects biologically relevant to humans. Data from studies of longer duration, greater than twenty-eight (28)

days, and LOAELs from these studies may be more appropriate in some cases for derivation of Tier II values. Use of a LOAEL should be based on consideration of the following information:

(i) Severity of effect.

(ii) Quality of the study.

(iii) Duration of the study.

(3) The following procedures shall be used to determine minimum bioaccumulation data requirements:

(A) To be considered a Tier I cancer or noncancer human health criterion, along with satisfying the minimum toxicity data requirements of subdivisions (1)(E) and (2)(A), a chemical must have the following minimum bioaccumulation data:

(i) For all organic chemicals either:

(AA) a field-measured BAF;

(BB) a BAF derived using the BSAF methodology; or

(CC) a chemical with a BAF less than one hundred twenty-five (125) regardless of how the BAF was derived.

(ii) For all inorganic chemicals, including organometals such as mercury, either:

(AA) a field-measured BAF; or

(BB) a laboratory-measured BCF.

(B) A chemical is considered a Tier II cancer or noncancer human health value if it does not meet either the minimum toxicity data requirements of subdivisions (1)(E) and (2)(A) or the minimum bioaccumulation data requirements of clause (A).

(c) The fundamental components of the procedure to calculate Tier I criteria or Tier II values are the same. However, certain of the aspects of the procedure designed to account for short duration studies or other limitations in data are more likely to be relevant in deriving Tier II values than Tier I criteria. The following procedures shall be used to develop Tier I criteria and Tier II values:

(1) The following procedures apply for carcinogens:

(A) A nonthreshold mechanism of carcinogenesis shall be assumed unless biological data adequately demonstrate the existence of a threshold on a chemical specific basis.

(B) All appropriate human epidemiologic data and animal cancer bioassay data shall be considered. Data specific to an environmentally appropriate route of exposure shall be used. Oral exposure should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. The risk associated dose shall be set at a level corresponding to an incremental cancer risk of one (1) in one hundred thousand (100,000). If acceptable human epidemiologic data are available for a chemical, it shall be used to derive the risk associated dose. If acceptable human epidemiologic data are not available, the risk associated dose shall be derived from available animal bioassay data. Data from a species that is considered most biologically relevant to humans, that is, responds most like humans, is preferred where all other considerations regarding quality of data are equal. In the absence of data to distinguish the most relevant species, data from the most sensitive species tested, that is, the species showing a carcinogenic effect at the lowest administered dose, shall generally be used.

(C) When animal bioassay data are used and a nonthreshold mechanism of carcinogenicity is assumed, the data are fitted to a linearized multistage computer model. The upper bound ninety-five percent (95%) confidence limit on risk (or the lower ninety-five percent (95%) confidence limit on dose) at the one (1) in one hundred thousand (100,000) risk level shall be used to calculate a risk associated dose (RAD). Other models, including modifications or variations of the linear multistage model that are more appropriate to the available data may be used where scientifically justified.

(D) If the duration of the study is significantly less than the natural life span of the test animal, the slope may be adjusted on a case-by-case basis to compensate for latent tumors that were not expressed. In the absence of alternative approaches that compensate for study durations significantly less than lifetime, the commissioner may use the process described in the 1980 National Guidelines (see 45 FR 79352).

(E) A species scaling factor shall be used to account for differences between test species and humans. It shall be assumed that milligrams per surface area per day is an equivalent dose between species (1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment). All doses presented in milligram per kilogram body weight will be converted to an equivalent surface area dose by raising the milligram per kilogram dose to the two-thirds ($\delta\wr$) power. However, if adequate pharmacokinetic and metabolism studies are available, these data may be factored into the adjustment for species differences on a case-by-case basis.

(F) Additional data selection and adjustment decisions must also be made in the process of quantifying risk.

Consideration must be given to tumor selection for modeling, for example, pooling estimates for multiple tumor types and identifying and combining benign and malignant tumors. All doses shall be adjusted to give an average daily dose over the study duration. Adjustments in the rate of tumor response must be made for early mortality in test species. The goodness-of-fit of the model to the data must also be assessed.

(G) When a linear, nonthreshold dose response relationship is assumed, the RAD shall be calculated using the following equation:

$$RAD = \frac{0.00001}{q_1^*}$$

Where: RAD = risk associated dose in milligrams of toxicant per kilogram body weight per day (mg/kg/day).

$0.00001\ (1 \times 10^{-5})$ = incremental risk of developing cancer equal to one (1) in one hundred thousand (100,000).

$q_1^*$ = slope factor $(mg/kg/day)^{-1}$.

(H) If human epidemiologic data or other biological data (animal) indicate that a chemical causes cancer via a threshold mechanism, the risk associated dose may, on a case-by-case basis, be calculated using a method that assumes a threshold mechanism is operative.

(2) The following procedures apply for noncarcinogens:

(A) Noncarcinogens shall generally be assumed to have a threshold dose or concentration below which no adverse effects should be observed. Therefore, the Tier I criterion or Tier II value is the maximum water concentration of a substance at or below which a lifetime exposure from drinking the water, consuming fish caught in the water, and ingesting water as a result of participating in water related recreation activities is likely to be without appreciable risk of deleterious effects. For some noncarcinogens, there may not be a threshold dose below which no adverse effects should be observed. Chemicals acting as genotoxic teratogens and germline mutagens are thought to possibly produce reproductive or developmental effects via a genetically linked mechanism which may have no threshold. Other chemicals also may not demonstrate a threshold. Criteria for these types of chemicals will be established on a case-by-case basis using appropriate assumptions reflecting the likelihood that no threshold exists.

(B) All appropriate human and animal toxicologic data shall be reviewed and evaluated. To the maximum extent possible, data most specific to the environmentally relevant route of exposure shall be used. Oral exposure data should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. When acceptable human data are not available, for example, well-conducted epidemiologic studies, animal data from species most biologically relevant to humans shall be used. In the absence of data to distinguish the most relevant species, data from the most sensitive animal species tested, such as the species showing a toxic effect at the lowest administered dose (given a relevant route of exposure), should generally be used.

(C) Minimum data requirements are specified in subsection (b)(2). The experimental exposure level representing the highest level tested at which no adverse effects were demonstrated (NOAEL) from studies satisfying the provisions of subsection (b)(2) shall be used for criteria calculations. In the absence of a NOAEL, the LOAEL from studies satisfying the provisions of subsection (b)(2) may be used if it is based on relatively mild and reversible effects.

(D) Uncertainty factors (UFs) shall be used to account for the uncertainties in predicting acceptable dose levels for the general human population based upon experimental animal data or limited human data as follows:

(i) A UF of ten (10) shall generally be used when extrapolating from valid experimental results from studies on prolonged exposure to average healthy humans. This ten (10) fold factor is used to protect sensitive members of the human population.

(ii) A UF of one hundred (100) shall generally be used when extrapolating from valid results of long term studies on experimental animals when results of studies of human exposure are not available or are inadequate. In comparison to item (i), this represents an additional ten (10) fold UF in extrapolating data from the average animal to the average human.

(iii) A UF of up to one thousand (1,000) shall generally be used when extrapolating from animal studies for which the exposure duration is less than chronic, but greater than subchronic, for example, ninety (90) days or more in length, or when other significant deficiencies in study quality are present, and when useful long term human data are not available. In comparison to item (ii), this represents an

additional UF of up to ten (10) fold for less than chronic, but greater than subchronic, studies.

(iv) A UF of up to three thousand (3,000) shall generally be used when extrapolating from animal studies for which the exposure duration is less than subchronic, for example, twenty-eight (28) days. In comparison to item (ii), this represents an additional UF of up to thirty (30) fold for less than subchronic studies. The level of additional uncertainty applied for less than chronic exposures depends on the duration of the study used relative to the lifetime of the experimental animal.

(v) An additional UF of between one (1) and ten (10) may be used when deriving a criterion from a LOAEL. This UF accounts for the lack of an identifiable NOAEL. The level of additional uncertainty applied may depend upon the severity and the incidence of the observed adverse effect.

(vi) An additional UF of between one (1) and ten (10) may be applied when there are limited effects data or incomplete subacute or chronic toxicity data, for example, reproductive or developmental data. The level of quality and quantity of the experimental data available as well as structure activity relationships may be used to determine the factor selected.

(vii) When deriving a UF in developing a Tier I criterion or Tier II value, the total uncertainty, as calculated following the procedures in items (i) through (vi) shall not exceed ten thousand (10,000) for Tier I criteria and thirty thousand (30,000) for Tier II values.

(E) All study results shall be converted, as necessary, to the standard unit for acceptable daily exposure of milligrams of toxicant per kilogram of body weight per day (mg/kg/day). Doses shall be adjusted for continuous exposure, that is, seven (7) days per week, twenty-four (24) hours per day.

(F) The acceptable daily exposure (ADE) shall be calculated using the following equation:

ADE =

func {{NOAEL ~(`\or\ ~LOAEL`)} over {UF}}

Where:

ADE = Acceptable daily exposure in milligrams of toxicant per kilogram body weight per day (mg/kg/day).

NOAEL (or LOAEL) = The no observed adverse effect level or lowest observed adverse effect level as determined in accordance with clause (C).

UF = The product of the uncertainty factors as determined in accordance with clause (D).

(3) The following procedures shall be used to derive criteria and values:

(A) The following represent the standard exposure assumptions used to calculate Tier I criteria and Tier II values for carcinogens and noncarcinogens. Different levels of exposure may be used where appropriate in deriving site-specific criteria pursuant to section 16 of this rule:

(i) BW = Body weight of an average human (BW = 70 kilograms).

(ii) $WC_d$ = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or

(iii) $WC_r$ = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters per day.

(iv) FC = Per capita daily consumption of regionally caught freshwater fish = 0.015 kg/day (0.0036 kilograms per day for trophic level three (3) and 0.0114 kilograms per day for trophic level four (4)).

(v) BAF = Bioaccumulation factor for trophic level three (3) and trophic level four (4) as derived using the BAF methodology in section 13 of this rule.

(B) The Tier I human cancer criteria or Tier II values shall be calculated as follows:

func{HCV~ = ~{RAD`` times``BW} over {WC ``+`` [(FC sub TL3``

times`` BAF sub TL3 SUP HH )`` +`` (FC sub TL4`` times`` BAF sub TL4 SUP HH)]}}

Where:

HCV = Human cancer value in milligrams per liter (mg/L).

RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg/day) that is associated with a lifetime incremental cancer risk equal to one (1) in one hundred thousand (100,000).

BW = Weight of an average human (BW = 70 kilograms).

$WC_d$ = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or

$WC_r$ = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters per day.

$FC_{TL3}$ = Mean consumption of trophic level three (3) of regionally caught freshwater fish = 0.0036 kilograms per day.

$FC_{TL4}$ = Mean consumption of trophic level four (4) of regionally caught freshwater fish = 0.0114 kilograms per day.

$BAF_3$ = Bioaccumulation factor for trophic level three (3) fish as derived using the BAF methodology in section 13 of this rule.

$BAF_4$ = Bioaccumulation factor for trophic level four (4) fish as derived using the BAF methodology in section 13 of this rule.

(C) The Tier I human noncancer criteria or Tier II values shall be calculated as follows:

func{HNV~ = ~{ADE``times``BW``times``RSC} over {WC ``+`` [(FC sub TL3``times`` BAF sub TL3 SUP HH )`` +`` (FC sub TL4`` times`` BAF sub TL4 SUP HH)]}}

Where:

HNV = Human noncancer value in milligrams per liter (mg/L).

ADE = Acceptable daily exposure in milligrams toxicant per kilogram body weight per day (mg/kg/day).

RSC = Relative source contribution factor of eight-tenths (0.8). An RSC derived from actual exposure data may be developed using the methodology outlined by the 1980 National Guidelines (see 45 FR 79354).

BW = Weight of an average human (BW = 70 kilograms).

$WC_d$ = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or

$WC_r$ = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters/day.

$FC_{TL3}$ = Mean consumption of trophic level three (3) fish by regional sport fishers of regionally caught freshwater fish = 0.0036 kilograms per day.

$FC_{TL4}$ = Mean consumption of trophic level four (4) fish by regional sport fishers of regionally caught freshwater fish = 0.0114 kilograms per day.

$BAF_3$ = Human health bioaccumulation factor for edible portion of trophic level three (3) fish as derived using the BAF methodology in section 13 of this rule.

$BAF_4$ = Human health bioaccumulation factor for edible portion of trophic level four (4) fish as derived using the BAF methodology in section 13 of this rule.

*(Water Pollution Control Board; 327 IAC 2-1.5-14; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1398; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377)*

327 IAC 2-1.5-15 Determination of wildlife criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 15. (a) This section establishes a procedure that is required when developing Tier I wildlife criteria for bioaccumulative chemicals of concern (BCCs) as follows:

(1) This method may be used for the development of Tier I criteria or Tier II values for pollutants other than BCCs for which the commissioner determines:

(A) Tier I criteria or Tier II values are necessary for the protection of wildlife in the Great Lakes basin; and

(B) that this method is applicable to the pollutant.

(2) In the event that this procedure is used to develop criteria for pollutants other than BCCs, the procedure for deriving bioaccumulation factors under section 13 of this rule must be used. For chemicals that do not biomagnify to the extent of BCCs, it may be appropriate to select different representative species that are better examples of species with the highest exposures for the given chemical. In addition, section 16 of this rule describes the procedures for calculating

site-specific wildlife criteria.

(b) The following procedures shall be used to calculate wildlife values for Tier I criteria:

(1) Tier I wildlife values are to be calculated using the following equation:

func{WV~=~{{TD over {UF sub A~ times~ UF sub S~ times~ UF sub L~ }~ } times~ Wt} over {W~ +~ sum (F sub {TLi}~ times~ BAF sub {TLi} sup{WL})}}

Where:

WV = Wildlife value in milligrams of substance per liter (mg/L).

TD = Test dose (TD) in milligrams of substance per kilograms per day (mg/kg-d) for the test species. This shall be either a NOAEL or a LOAEL.

$UF_A$ = Uncertainty factor (UF) for extrapolating toxicity data across species (unitless). A species-specific UF shall be selected and applied to each representative species, consistent with the equation.

$UF_S$ = UF for extrapolating from subchronic to chronic exposures (unitless).

$UF_L$ = UF for LOAEL to NOAEL extrapolations (unitless).

Wt = Average weight in kilograms (kg) for the representative species.

W = Average daily volume of water consumed in liters per day (l/d) by the representative species.

$F_{TLi}$ = Average daily amount of food consumed from trophic level i in kilograms per day (kg/d) by the representative species.

$BAF_i$ = Bioaccumulation factor (BAF) for wildlife food in trophic level i in liters per kilogram (l/kg), developed using the BAF methodology in section 13 of this rule. For consumption of piscivorous birds by other birds, for example, herring gull by eagles, the BAF is derived by multiplying the trophic level three (3) BAF for fish by a biomagnification factor to account for the biomagnification from fish to the consumed birds.

(2) For bioaccumulative chemicals, piscivorous species are identified as the focus of concern for wildlife criteria development in the Great Lakes. This methodology identifies three (3) avian species (eagle, kingfisher, and herring gull) and two (2) mammalian species (mink and otter) as representative species for protection. The TD obtained from toxicity data for each taxonomic class is used to calculate WVs for each of the five (5) representative species.

(3) The avian WV is the geometric mean of the WVs calculated for the three (3) representative avian species. The mammalian WV is the geometric mean of the WVs calculated for the two (2) representative mammalian species. The lower of the mammalian and avian WVs must be selected as the Great Lakes wildlife criteria (GLWC).

(c) The following procedures shall be used to obtain the parameters of the effect component of the wildlife criteria procedure:

(1) A Test Dose (TD) value is required for criterion calculation. To derive a Tier I criterion for wildlife, the data set shall provide enough data to generate a subchronic or chronic dose response curve for any given substance for both mammalian and avian species.

(A) In reviewing the toxicity data available that meet the minimum data requirements for each taxonomic class, the following order of preference shall be applied to select the appropriate TD to be used for calculation of individual WVs:

(i) Data from peer-reviewed field studies of wildlife species take precedence over other types of studies, where such studies are of adequate quality. An acceptable field study must be of subchronic or chronic duration, provide a defensible, chemical specific dose response curve in which cause and effect are clearly established, and assess acceptable endpoints as defined in this rule.

(ii) When acceptable wildlife field studies are not available, or determined to be of inadequate quality, the needed toxicity information may come from peer reviewed laboratory studies. When laboratory studies are used, preference shall be given to laboratory studies with wildlife species over traditional laboratory animals to reduce uncertainties in making interspecies extrapolations.

(B) All available laboratory data and field studies shall be reviewed to corroborate the final GLWC, to assess the reasonableness of the toxicity value used, and to assess the appropriateness of any UFs that are applied. When evaluating the studies from which a test dose is derived in general, the following requirements must be met:

(i) The mammalian data must come from at least one (1) well-conducted study of ninety (90) days or greater designed to observe subchronic or chronic effects as defined in this rule.

(ii) The avian data must come from at least one well-conducted study of twenty-eight (28) days or

greater designed to observe subchronic or chronic effects as defined in this rule.

(iii) In reviewing the studies from which a TD is derived for use in calculating a WV, studies involving exposure routes other than oral may be considered only when an equivalent oral daily dose can be estimated and technically justified because the criteria calculations are based on an oral route of exposure.

(iv) In assessing the studies that meet the minimum data requirements, preference should be given to studies that assess effects on developmental or reproductive endpoints because, in general, these are more important endpoints in ensuring that a population's productivity is maintained.

(2) In selecting data to be used in the derivation of WVs, the evaluation of acceptable endpoints, as defined in this rule, will be the primary selection criterion. All data not part of the selected subset may be used to assess the reasonableness of the toxicity value and the appropriateness of the UFs that are applied.

(A) If more than one (1) TD value is available within a taxonomic class, based on different endpoints of toxicity, that TD, which is likely to reflect best potential impacts to wildlife populations through resultant changes in mortality or fecundity rates, shall be used for the calculation of WVs.

(B) If more than one (1) TD is available within a taxonomic class, based on the same endpoint of toxicity, the TD from the most sensitive species shall be used.

(C) If more than one (1) TD based on the same endpoint of toxicity is available for a given species, the TD for that species shall be calculated using the geometric mean of those TDs.

(3) The following exposure assumptions are made in the determination of the TD:

(A) In those cases in which a TD is available in units other than milligrams of substance per kilograms per day (mg/kg/d), clauses (B) and (C) shall be used to convert the TD to the appropriate units prior to calculating a WV.

(B) If the TD is given in milligrams of toxicant per liter of water consumed by the test animals (mg/L), the TD shall be multiplied by the daily average volume of water consumed by the test animals in liters per day (L/d) and divided by the average weight of the test animals in kilograms (kg).

(C) If the TD is given in milligrams of toxicant per kilogram of food consumed by the test animals (mg/kg), the TD shall be multiplied by the average amount of food in kilograms consumed daily by the test animals (kg/d) and divided by the average weight of the test animals in kilograms (kg).

(4) Drinking and feeding rates shall be determined as follows:

(A) When drinking and feeding rates and body weight are needed to express the TD in milligrams of substance per kilograms per day (mg/kg/d), they are obtained from the study from which the TD was derived. If not already determined, body weight and drinking and feeding rates are to be converted to a wet weight basis.

(B) If the study does not provide the needed values, the values shall be determined from appropriate scientific literature. When scientific literature does not contain exposure information for the species used in a given study, either the allometric equations which are presented in clauses (C) and (D), or the exposure estimation methods presented in Chapter 4 of the Wildlife Exposure Factors Handbook (U.S. EPA, 1993), shall be applied to approximate the needed feeding or drinking rates. The choice of the methods described in this clause is at the discretion of the commissioner.

(C) For mammalian species, the general allometric equations are:

(i) $F = (0.0687)(Wt)^{0.82}$

Where: F = Feeding rate of mammalian species in kilograms per day (kg/d) dry weight.

Wt = Average weight in kilograms (kg) of the test animals.

(ii) $W = (0.099)(Wt)^{0.90}$

Where: W = Drinking rate of mammalian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(D) For avian species, the general allometric equations are:

(i) $F = (0.0582)(Wt)^{0.65}$

Where: F = Feeding rate of avian species in kilograms per day (kg/d) dry weight.

Wt = Average weight in kilograms (kg) of the test animals.

(ii) $W = (0.059)(Wt)^{0.67}$

Where: W = Drinking rate of avian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(5) In those cases in which a NOAEL is unavailable as the TD and a LOAEL is available, the LOAEL may be used to estimate the NOAEL. If used, the LOAEL shall be divided by an UF to estimate a NOAEL for use in deriving WVs. The value of the UF shall not be less than one (1) and should not exceed ten (10), depending on the dose-response curve and any other available data, and is represented by $UF_L$ in the equation expressed in subsection (b)(1).

(6) In instances where only subchronic data are available, the TD may be derived from subchronic data. In such cases, the TD shall be divided by an UF to extrapolate from subchronic to chronic levels. The value of the UF shall not be less than one (1) and should not exceed ten (10), and is represented by $UF_S$ in the equation expressed in subsection (b)(1). This factor is to be used when assessing highly bioaccumulative substances where toxicokinetic considerations suggest that a bioassay of limited length underestimates chronic effects.

(7) The following procedure shall be used to determine an uncertainty factor for interspecies extrapolations ($UF_A$):

(A) The selection of the $UF_A$ shall be based on the available toxicological data and on available data concerning the physicochemical, toxicokinetic, and toxicodynamic properties of the substance in question and the amount and quality of available data. This value is an UF that is intended to account for differences in toxicological sensitivity among species.

(B) For the derivation of Tier I criteria, a $UF_A$ shall not be less than one (1) and should not exceed one hundred (100), and shall be applied to each of the five (5) representative species, based on existing data and best professional judgement. The value of $UF_A$ may differ for each of the representative species.

(C) For Tier I wildlife criteria, the $UF_A$ shall be used only for extrapolating toxicity data across species within a taxonomic class, except as provided in this clause. The Tier I $UF_A$ is not intended for interclass extrapolations because of the poorly defined comparative toxicokinetic and toxicodynamic parameters between mammals and birds. However, an interclass extrapolation employing a $UF_A$ may be used for a given chemical if it can be supported by a validated biologically based dose response model or by an analysis of interclass toxicological data, considering acceptable endpoints, for a chemical analog that acts under the same mode of toxic action.

(d) The following procedures shall be used to determine the parameters of the exposure component of the wildlife criteria procedure:

(1) The body weights (Wt), feeding rates ($F_{Tli}$), drinking rates (W), and trophic level dietary composition, as food ingestion rate and percent in diet, for each of the five (5) representative species are presented in Table 15-1 in subsection (e).

(2) The procedure for the determination of bioaccumulation factors is contained under section 13 of this rule. Trophic levels three (3) and four (4) BAFs are used to derive WVs because these are the trophic levels at which the representative species feed.

(e) The following exposure parameters for the five (5) representative species identified for protection shall be used:

Table 15-1

Exposure Parameters for the Five Representative Species Identified for Protection

| Species | Adult Body Weight (kg) | Water Ingestion Rate (L/day) | Food Ingestion Rate of Prey in Each Trophic Level (kg/day) | Trophic Level of Prey (Percent of Diet) |
|---|---|---|---|---|
| Mink | 0.80 | 0.081 | TL3: 0.159<br>Other: 0.0177 | TL3: 90%<br>Other: 10% |
| Otter | 7.4 | 0.600 | TL3: 0.977<br>TL4: 0.244 | TL3: 80%<br>TL4: 20% |
| Kingfisher | 0.15 | 0.017 | TL3: 0.0672 | TL3: 100% |
| Herring gull | 1.1 | 0.063 | TL3: 0.192<br>TL4: 0.0480<br>Other: 0.0267 | Fish: 90%<br>TL3: 80%<br>TL4: 20%<br>Other: 10% |

| | | | | |
|---|---|---|---|---|
| Bald eagle | 4.6 | 0.160 | TL3: 0.371<br>TL4: 0.0929<br>PB: 0.0283<br>Other: 0.0121 | Fish: 92%<br>TL3: 80%<br>TL4: 20%<br>Birds: 8%<br>PB: 70%<br>nonaquatic: 30% |

TL3 = trophic level three fish

TL4 = trophic level four fish

PB = piscivorous birds

Other = nonaquatic birds and mammals

*(Water Pollution Control Board; 327 IAC 2-1.5-15; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1404; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-16 Site-specific modifications to Tier I criteria and Tier II values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-15-4-1; IC 13-18-4

Sec. 16. (a) Site-specific modifications of criteria and values in this subsection must be protective of designated uses and aquatic life, wildlife, or human health. In addition, any site-specific modifications that result in less stringent criteria must be based on a sound scientific rationale and shall not be likely to jeopardize the continued existence of endangered or threatened species listed or proposed under Section 4 of the Endangered Species Act (ESA) or result in the destruction or adverse modification of such species' critical habitat. More stringent modifications shall be developed to protect endangered or threatened species listed or proposed under Section 4 of the ESA, where such modifications are necessary to ensure that water quality is not likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such species' critical habitat. More stringent modifications may also be developed to protect candidate (C1) species being considered by the U.S. Fish and Wildlife Service (FWS) for listing under Section 4 of the ESA, where such modifications are necessary to protect such species. Criteria and values may be modified on a site-specific basis to reflect local environmental conditions as restricted by the following provisions:

(1) Aquatic life criteria or values may be modified on a site-specific basis as follows:

(A) Aquatic life criteria or values may be modified on a site-specific basis to provide an additional level of protection.

(B) Less stringent site-specific modifications to chronic or acute aquatic life criteria or values may be developed when either of the following conditions apply:

(i) The local water quality characteristics such as pH, hardness, temperature, or color alter the biological availability or toxicity of a pollutant.

(ii) The sensitivity of the aquatic organisms species that occur at the site differs from the species actually tested in developing the criteria.

(C) Less stringent modifications also may be developed to acute and chronic aquatic life criteria or values to reflect local physical and hydrological conditions.

(D) Any modifications to protect threatened or endangered aquatic species required by this subsection may be accomplished using either of the two (2) following procedures:

(i) If the Species Mean Acute Value (SMAV) for a listed or proposed species, or for a surrogate of such species, is lower than the calculated Final Acute Value (FAV), such lower SMAV may be used instead of the calculated FAV in developing site-specific modified criteria.

(ii) The site-specific criteria may be calculated using the recalculation procedure for site-specific modifications.

(2) Wildlife criteria or values may be modified on a site-specific basis as follows:

(A) Wildlife water quality criteria may be modified on a site-specific basis to provide an additional level of protection.

(B) Less stringent site-specific modifications to wildlife water quality criteria may be developed when a site-specific bioaccumulation factor (BAF) is derived that is lower than the system-wide BAF derived under section 13 of this rule. The modification must consider both the mobility of prey organisms and wildlife populations in defining the site for which criteria are developed. In addition, there must be a showing that the

following conditions are met:

(i) Any increased uptake of the toxicant by prey species utilizing the site will not cause adverse effects in wildlife populations.

(ii) Wildlife populations utilizing the site or downstream waters will continue to be fully protected.

(C) Any modification to protect endangered or threatened wildlife species required by this subsection must consider both the mobility of prey organisms and wildlife populations in defining the site for which criteria are developed, and may be accomplished by using the following recommended method:

(i) The procedure presented in section 15 of this rule is used, substituting appropriate species-specific toxicological, epidemiological, or exposure information, including changes to the BAF.

(ii) An interspecies uncertainty factor of one (1) shall be used where epidemiological data are available for the species in question. If necessary, species-specific exposure parameters may be derived as presented in section 15 of this rule.

(iii) An intraspecies uncertainty factor, to account for protection of individuals within a wildlife population, shall be applied in the denominator of the effect part of the wildlife equation in section 15 of this rule in a manner consistent with the other uncertainty factors described in section 15 of this rule.

(iv) The resulting wildlife value for the species in question should be compared to the two (2) class specific wildlife values that were previously calculated, and the lowest of the three (3) shall be selected as the site-specific modification.

(3) BAFs may be modified on a site-specific basis as follows:

(A) BAFs may be modified on a site-specific basis to larger values where reliable data show that local bioaccumulation is greater than the system-wide value.

(B) BAFs may be modified on a site-specific basis to lower values, where scientifically defensible, if:

(i) the fraction of the total chemical that is freely dissolved in the ambient water is different than that used to derive the system-wide BAFs, that is, the concentrations of particulate organic carbon and the dissolved organic carbon are different than those used to derive the system-wide BAFs;

(ii) input parameters of the model, such as the structure of the aquatic food web and the disequilibrium constant, are different at the site than those used to derive the system-wide BAFs;

(iii) the percent lipid of aquatic organisms that are consumed and occur at the site is different than that used to derive the system-wide BAFs; or

(iv) site-specific field-measured BAFs or biota-sediment accumulation factor (BSAFs) are determined.

(C) If site-specific BAFs are derived, they shall be derived using section 13 of this rule.

(D) Any more stringent modifications to protect threatened or endangered species required by this subsection shall be derived using procedures set forth in the methodology in section 13 of this rule.

(4) Human health criteria or values may be modified on a site-specific basis as follows:

(A) Human health criteria or values may be modified on a site-specific basis to provide an additional level of protection. Human health criteria or values shall be modified on a site-specific basis to provide additional protection appropriate for highly exposed subpopulations. Any person may request the commissioner to develop a site-specific modification of a human health criterion or value to make it more stringent. The commissioner shall develop the site-specific modification of the human health criterion or value to make it more stringent when either of the following conditions apply:

(i) Local fish consumption rates are higher than the rate used to derive a human health criterion or value applicable under section 14 of this rule.

(ii) A site-specific BAF is derived that is higher than that used in deriving a human health criterion of value under section 14 of this rule.

(B) Less stringent site-specific modifications to human health criteria or values may be developed when any of the following conditions apply:

(i) Local fish consumption rates are lower than the rate used in deriving human health criteria or values under section 14 of this rule.

(ii) A site-specific BAF is derived that is lower than that used in deriving human health criteria or values under section 14 of this rule.

(C) Local fish consumption rates referenced in clauses (A)(i) and (B)(i) shall be determined by a fish consumption survey applicable to the site.

(b) Upon receipt of a request for a site-specific modification of a water quality criterion or value, the commissioner shall provide notice, request comment, and, if requested, schedule and hold a public meeting on the application in accordance

with 327 IAC 5-2-11.2.

(c) When the commissioner proposes a site-specific modification to a criterion or value as allowed in this section, the tentative decision shall be incorporated into a draft permit which is made available for public comment under 327 IAC 5-3-9. The commissioner shall notify the other Great Lakes states of such a proposal and, for less stringent criteria, shall supply appropriate supporting documentation for the modification.

(d) A final decision regarding a site-specific modification to a criterion or value shall be incorporated into the final NPDES permit. In addition, a reopening clause shall be included in the NPDES permit allowing the permit to be modified or revoked and reissued to revise the WQBELs based on the modified criterion or value if the board fails to adopt or the U.S. EPA fails to approve the modified criterion or value.

(e) All site-specific modifications to water quality criteria shall be incorporated into these water quality standards rules during the next revision of the water quality standards. The U.S. EPA will have the opportunity to review the modified criterion or value upon submittal of the revised water quality standards rules adopted by the board. *(Water Pollution Control Board; 327 IAC 2-1.5-16; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1407; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-17 Variances from water quality standards for point sources

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 4-22-2; IC 13-11-2-24; IC 13-13-5; IC 13-18-4; IC 13-18-7; IC 13-23-13; IC 13-24-1; IC 13-25-5; IC 13-30-2-1

Sec. 17. (a) A permit applicant or permittee may apply to the commissioner for a variance from the water quality standard used to derive a water quality-based effluent limitation (WQBEL) contained in a NPDES permit for a specific substance. The application for such a variance shall be submitted in accordance with 327 IAC 5-3-4.1. The following do not constitute an undue hardship or burden, therefore, a variance to a water quality standard shall not be granted:

(1) that would likely jeopardize the continued existence of any endangered or threatened species listed under Section 4 of the Endangered Species Act (ESA) or result in the destruction or adverse modification of such species' critical habitat;

(2) if standards will be attained by implementing effluent limits required under Sections 301(b) and 306 of the Clean Water Act (CWA) and by the permittee implementing cost-effective and reasonable best management practices for nonpoint source control at the facility; or

(3) to recommencing dischargers or new Great Lakes dischargers, unless the new Great Lakes discharge occurs as the result of:

(A) a response action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended (as defined in IC 13-11-2-24);

(B) a corrective action pursuant to the Resource Conservation and Recovery Act (RCRA), as amended (as defined in IC 13-13-5); or

(C) an action pursuant to similar federal or state authorities, including, but not limited to:

(i) an underground storage tank (UST) corrective action under IC 13-23-13;

(ii) a remediation of petroleum releases under IC 13-24-1;

(iii) a voluntary remediation under IC 13-25-5; or

(iv) an abatement or correction of any polluted condition under IC 13-18-7.

(b) The commissioner may approve all or part of a requested variance, or modify and approve a requested variance, if the permit applicant demonstrates that implementing a proposed methodology, that includes any production processes, wastewater treatment technology, or combination thereof used to reduce pollutants discharged in the wastewater from a facility, as identified under 327 IAC 5-3-4.1(b)(2)(A), will cause an undue hardship or burden upon the applicant.

(c) In making a determination on a variance application, the commissioner shall balance the increased risk to human health and the environment if the variance is granted against the hardship or burden upon the applicant if the variance is not granted so that the commissioner is able to conclude that any increased risk is consistent with the protection of the public health, safety, and welfare. In balancing these factors, the commissioner shall consider the following to determine if the hardship or burden upon the applicant is undue:

(1) For variance applications, except those governed under subdivision (2), the following shall be considered:

(A) The cost and cost effectiveness of pollutant removal by implementing the methodologies proposed by the applicant and the methodology capable of attaining the WQBEL.

(B) The reduction in concentrations and loadings of pollutants attainable by the methodologies proposed by the applicant as compared with the reduction attainable by use of the methodology capable of attaining the WQBEL.

(C) The impact of the proposed methodologies and the methodology capable of attaining the WQBEL on the

price of the goods or services provided by the applicant.

(D) Information on the relative price of goods or services in the same market as the applicant.

(E) The overall impact of attaining the WQBEL and implementing the proposed methodologies on employment at the facility.

(F) Information on the type and magnitude of adverse or beneficial environmental impacts, including the net impact on the receiving water, resulting from the proposed methodologies that could be applied to the control of the substance for which a variance is applied. This information shall include the extent of any increased risk to human health and the environment associated with each of the proposed methodologies.

(G) Other relevant information requested by the commissioner or supplied by the applicant or the public.

(2) For variance applications where the necessity for the variance is a short term, temporary discharge resulting from the dredging of contaminated sediments from a waterbody and is conducted under any of the federal or state authorities listed under subsection (a)(3), the following shall be considered:

(A) The cost and cost effectiveness of pollutant removal by implementing the methodologies proposed by the applicant and the methodology capable of attaining the WQBEL.

(B) The reduction in concentrations and loadings of pollutants attainable by the methodologies proposed by the applicant as compared with the reduction attainable by use of the methodology capable of attaining the WQBEL.

(C) Information on the type and magnitude of adverse or beneficial environmental impacts, including the net impact on the receiving water, resulting from the proposed methodologies that could be applied to the control of the substance for which a variance is applied. This information shall include the extent of any increased risk to human health and the environment associated with each of the proposed methodologies. In considering the information required by this clause, the commissioner shall also consider that the action is the following:

(i) For the protection, maintenance, or restoration of the environment.

(ii) Short term and temporary.

(D) Other relevant information requested by the commissioner or supplied by the applicant or the public.

(d) The commissioner may grant the variance when the requirements of subsections (b) and (c) are met.

(e) A determination to grant or deny a requested variance shall be made in accordance with 327 IAC 5-3-4.1. In making this determination, the commissioner may also consider other information available to the agency or supplied by the applicant or the public.

(f) A variance applies only to the permit applicant requesting the variance and only to the substance specified in the variance application. The granting of a variance does not imply or require that the water quality standard corresponding to the variance be modified through a rulemaking in accordance with IC 4-22-2 and IC 13-14-9.

(g) A variance or any renewal thereof shall not be granted for a term greater than that allowed by IC 13-14-8. Notwithstanding the time at which the application for a variance is submitted under 327 IAC 5-3-4.1, a variance shall not be granted for a term greater than the term remaining under the permit to which the variance is attached.

(h) Neither the filing of a variance application nor the granting of a variance shall be grounds for the staying or dismissing of or a defense in a pending enforcement action. A variance shall be prospective only. *(Water Pollution Control Board; 327 IAC 2-1.5-17; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1409; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-18 Designation of a waterbody as a limited use water or an outstanding state resource water

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 18. (a) A person who wishes to propose that a waterbody within the Great Lakes system be considered by the commissioner for designation as a limited use or outstanding state resource water shall submit to the commissioner a written proposal:

(1) identifying the waterbody and the proposed designation stating the rationale for the proposal; and

(2) including any other supporting documentation.

(b) The commissioner shall evaluate the proposal considering the following:

(1) Waters that meet the following conditions may be considered for designation as a limited use water:

(A) Waters that have:

(i) naturally poor physical characteristics (that is, suitable habitat to support a well-balanced fish community is severely limited or absent) including lack of sufficient flow ($Q_{7,10}$ low flow upstream of any existing or proposed discharge of one-tenth (0.1) cubic foot per second or less);

(ii) naturally poor chemical quality;

(iii) irreversible man-induced conditions that came into existence prior to January 1, 1983; and

(iv) no unique or exceptional features.

(B) No potential or existing uses made of the waterbody by people in the immediate area would be adversely affected by a limited use designation.

(C) The waterbody has been evaluated by a use attainability analysis.

(2) Factors that relate to outstanding state resource water designations may include, but are not limited to, the following:

(A) The presence of a unique or exceptional habitat or species in the waterbody.

(B) The presence of a rare or endangered species in the waterbody.

(C) The presence of exceptional aesthetic quality in the immediate environs of the waterbody.

(D) The waterbody is within the boundaries of or flows through a designated natural area, nature preserve, or state or national park or forest.

(E) The waterbody supports an excellent sports fishery.

(F) The waterbody possesses exceptional quality.

(G) Intensive recreational use is made of the waterbody.

(H) Designation as a natural, scenic, or recreational waterbody by the Indiana department of natural resources.

Irrespective of these factors, the commissioner's evaluation will generally be a case-by-case determination using information obtained from an on-site evaluation. If appropriate, the commissioner shall consult with the Indiana department of natural resources concerning the designation of a waterbody as an outstanding state resource water.

(c) After completion of the evaluation under subsection (b), if the commissioner determines that reclassification of the waterbody is appropriate, the commissioner shall initiate a rulemaking to include the waterbody either as a limited use water or an outstanding state resource water under section 19 of this rule.

(d) All waters that are designated as a limited use water under section 19(a) of this rule must be evaluated for restoration and upgrading at each triennial review of this rule.

(e) The department shall initiate a special designations rulemaking in accordance with the following:

(1) The special designations rulemaking shall be initiated for the purposes of:

(A) determining whether any other designations in addition to outstanding state resource waters, high quality waters, limited use waters, and outstanding national resource waters should be established;

(B) determining the appropriate factors to consider in designating a waterbody;

(C) identifying a list of waterbodies for each special designation; and

(D) specifying antidegradation implementation procedures for outstanding state resource waters, outstanding national resource waters, and for any other newly established designation.

(2) Prior to the presentation of proposed rules on special designations to the board, the department shall consult with other state and federal agencies, and with interested persons within Indiana as appropriate. The department shall provide information to the public on the history, intent, and importance of the current outstanding state resource water designation and the list of outstanding state resource waters.

(3) The department shall seek comment, as part of the second notice on special designations, on adding waterbodies to the list of outstanding national resource waters, on the specific interim antidegradation implementation procedures included in 327 IAC 5-2-11.7 for outstanding state resource waters, and on procedures for addressing increases not included in the specific exceptions listed in 327 IAC 5-2-11.7(c)(2).

(4) The following statement shall be included in the second notice and shall be used as a guide during the special designation rulemaking, “The interim antidegradation implementation procedures for outstanding state resource waters in 327 IAC 5-2-11.7 are intended only to assure that a specific process exists to address proposed changes pending the completion of the special designation rulemaking. The board does not consider the specific procedures listed in 327 IAC 5-2-11.7 as a final policy statement or as binding on the board in the special designation rulemaking.”.

(5) The department shall present rules to the board on a schedule such that final rules may be adopted and made effective prior to the expiration of 327 IAC 5-2-11.7.

*(Water Pollution Control Board; 327 IAC 2-1.5-18; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1410; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-19 Limited use waters and outstanding state resource waters

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 19. (a) The following waters within the Great Lakes system are designated for limited use:

(1) Hoffman Ditch in St. Joseph County upstream from its confluence with Yellow River.

(2) Berlin Court Ditch in Elkhart County from the Nappanee sewage treatment plant to two (2) miles downstream.

(3) An unnamed tributary and Werntz Ditch in Elkhart County from the Wakarusa STP to the confluence of Werntz Ditch and Baugo Creek.
(4) Hilkey Ditch in DeKalb County from the County Line Cheese Company outfall to North County Line Road one and one-half (1.5) miles downstream.
(5) Hindman Ditch in DeKalb County from the Ralph Sechler Company outfall downstream to its confluence with Bear Creek.
(b) The following waters within the Great Lakes system are designated as an outstanding state resource water:
(1) Cedar Creek in Allen and DeKalb counties, from river mile 13.7 to its confluence with the St. Joseph River.
(2) The Indiana portion of the open waters of Lake Michigan.
(3) All waters incorporated in the Indiana Dunes National Lakeshore.

*(Water Pollution Control Board; 327 IAC 2-1.5-19; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1411; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-20 Incorporation by reference
Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 20. The following materials have been incorporated by reference into this rule. Each of the following items, in addition to its title, will list the name and address of where it may be located for inspection and copying:
(1) Clean Water Act (CWA), 33 U.S.C. 1251 et seq., in effect December 16, 1996, is available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or from the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(2) The map identifying 1995 United States Coast Guard Light List No. 19675 is available from the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(3) Code of Federal Regulations (40 CFR 136) in effect December 16, 1996, are available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 or the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(4) ASTM, 1990, Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs, Standard E 1022, available from the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(5) 1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1986), available from the U.S. Environmental Protection Agency, Office of Water Resource Center (WH-550A), 401 M Street, S.W., Washington, D.C. 20460, and the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(6) U.S. EPA. 1993, Chapter 4, Wildlife Exposure Factors Handbook, Volumes I and II, available from U.S. Environmental Protection Agency, Office of Water Resource Center, 401 M Street, S.W., Washington, D.C. 20460 [EPA/600/R-93/187a and b], and the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 North Senate Avenue, Indianapolis, Indiana 46206.
(7) “Standard Methods for the Examination of Water and Wastewater”, Joint Editorial Board, American Public Health Association, American Water Works Association, and Water Environment Federation, 18th Edition, 1992. Available from American Public Health Association, 1015 Fifteenth Street, N.W., Washington, D.C. 20005, and the Indiana Department of Environmental Management, Office of Water Management, Indiana Government Center-North, 100 Senate Avenue, Indianapolis, Indiana 46206.
(8) 1980 National Guidelines, 45 FR 79352 and 45 FR 79354.

*(Water Pollution Control Board; 327 IAC 2-1.5-20; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1412; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*